

UNITED STATES. CIRCUIT COURT. DISTRICT
OF NEW JERSEY

American Graphophone Company	} In Equity on Patent No. 606725.
vs. National Phonograph Company	

RECORD

53

Circuit Court of the United States,
District of New Jersey.

AMERICAN GRAPHOPHONE COMPANY

vs.

NATIONAL PHONOGRAPH COMPANY.

In Equity.

On Macdonald Patent No. 606,725.

RECORD.

PHILIP MAURO,
C. A. L. MASSIE,

Solicitors and of Counsel for Complainant.

FRANK L. DYER,

Solicitor and of Counsel for Defendant.

MacCrellish & Quigley, Book and Job Printers, Trenton, N. J.

Circuit Court of the United States,
District of New Jersey.

AMERICAN GRAPHOPHONE COMPANY
vs.
NATIONAL PHONOGRAPH COMPANY.

In Equity.

On Macdonald Patent No. 606,725.

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United States Circuit Court,
DISTRICT OF NEW JERSEY.

AMERICAN GRAPHOPHONE COMPANY,
Complainant,

vs.

NATIONAL PHONOGRAPH COMPANY,
Defendant.

In Equity.
On Letters Patent
No. 606,725.

DEFENDANT'S PAPER EXHIBITS.

FRANK L. DYER,
Solicitor for Defendant.

C. G. Burgoyns, Walker and Centre Streets, N. Y.

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United States Circuit Court,
District of New Jersey.

AMERICAN GRAPHOPHONE
COMPANY,

Complainant,

vs.

NATIONAL PHONOGRAPH
COMPANY,

Defendant.

In Equity.

No. 10.

March Term, 1905.

DEFENDANT'S PAPER EXHIBITS.

C. G. BURGoyNE, Walker and Centre Street, N. Y.

568
3
Defendant's Exhibit Macdonald File Wrapper



To all persons to whom these presents shall come, Greeting:

This is to certify That the annexed is a true copy from the

Records of this office of the File Wrapper
and contents in the matter of the

Letters Patent of

Thomas H. Macdonald, Assignor to the
American Graphophone Company.

Number 606,725, Granted July 5, 1898,

for
Improvement in Manufacture of Graphophone Tablets.

In testimony whereof I hereunto set my hand and
caused the seal of the Patent Office to be affixed at
the City of Washington this tenth day
of June, in the year of our Lord
one thousand nine hundred and five
and of the Independence of the United States of
America the one hundred and twenty-ninth.

F. J. Allen

Commissioner of Patents.

AMOUNT RECEIVED

\$ 15-
CHIEF CLERK.

P E T I T I O N.

To the Commissioner of Patents:

Your petitioner Thomas H. Macdonald resident of Bridgeport, Connecticut, prays that Letters-Patent of the United States may be granted to him for the Improvements in the Manufacture of Graphophone tablets, set forth in the annexed specification; and he hereby appoints Anthony Pollok, Esq., and Philip Mauro, Esq., (composing the firm of Pollok & Mauro), of the city of Washington, in the District of Columbia, his attorneys, with full power of substitution and revocation, to prosecute this application, to make alterations and amendments therein, to receive the patent, and to transact all business in the Patent Office connected therewith.

Thomas H. Macdonald.

S P E C I F I C A T I O N.

To all whom it may concern:

Be it known that ^I_A Thomas H. Macdonald, of Bridgeport, Connecticut, have invented a new and useful Improvements in the Manufacture Graphophone Tablets which improvements are fully set forth in the following specification:

This invention relates to the manufacture of tablets or blanks adapted to receive engraved records of sounds, and more particularly to the composition of matter of which the tablet is composed.

The recording material, in order to answer well the requirements of ^{the} engraving method of recording sounds, should be perfectly amorphous, slightly cohesive, and capable of being removed cleanly and smoothly in chips or shavings under the action of the recording stylus when actuated by the feeble force of sound waves. The material moreover should be sufficiently hard to withstand ordinary handling, to retain perfectly its form, and to resist the effect of ordinary changes of temperature. It should also be a stable compound or material, in order that records made in it may be preserved for indefinite lengths of time.

As pointed out in Letters Patent No. 341,214, granted May 4, 1886 to C.A. Bell & S. Tainter, the properties above indicated reside in greater or less degree in wax and wax-like substances, such as beeswax, paraffin, stearine, etc. though by special preparation of these and similar substances their fitness for the purpose in view has been increased.

It has been heretofore proposed to use as a sound recording material an insoluble soap made by saponification of any fatty acid by means of an earthly alkali, such as lime. It has also been proposed to employ a metal such as lead, combined with stearic or oleic acid, and particularly a mixture of oleate and stearate of lead. But tablets made of insoluble lime soap, or of stearates or oleates of lead have never yielded commercially successful results. Several practical difficulties have been encountered in endeavoring to make tablets composed wholly or in part of soap. The chief difficulty has been that the surfaces of such tablets become

coated, after a greater or less length of time, with a bluish film having the appearance of mold, and which has been termed "efflorescence". This is due to the presence in the material of hygroscopic compounds, which, on being attacked by moisture work out to and spread upon the surface of the tablet.

I have found that lead in any form, as well as most of the salts of other metals which might be otherwise suitable for the purpose in view, give rise to hygroscopic compounds. This ^{3/21/98} is particularly true of stearates and acetates ^{of lead}.

Another difficulty that arises is the formation of crystalline or crystallizable compounds in the operation of making soap. The object of introducing a metal (or metallic salt) is to prevent all tendency to crystallization, it being of the first importance to secure a composition which shall be, and under all conditions remains perfectly amorphous, and presenting equal resistance to cutting in every direction.

All ordinary commercial soaps have this tendency to crystallization in some degree, it not being possible to introduce sufficient sodium or soda salt to prevent all crystallization.

Insert

73.

Mar

16/98

73. In carrying out my invention, whereby all the conditions herein pointed out as essential, are secured, I take stearic acid, as nearly pure as can be obtained, and convert it into soda soap in the manner hereafter explained. The composition, however, differs from ordinary soap in that it contains no oleates, I having found that the presence of even a small quantity of oleate or oleic acid is detrimental. It is also important that the tallow, or other source from which the stearic acid is obtained, be completely deglycerinized.

Except under these conditions the result will be unsatisfactory.

In converting the stearic acid into soap I produce only a partial saponification; that is to say, instead of

using the chemical equivalent in caustic alkali of the fat
Dec 27/17 acid, I use about forty percent of that ^{of alkali} quantity, this produc-
ing what may be called a soap of about two-fifths saponifi-
cation. This is the proportion which gives the best results,
but is of course variable within limits. The controlling
consideration is that the greater the quantity of alkali, the
higher will be the melting point of the resulting soap, and
a complete saponification will produce a soap which requires
to melt it a temperature which will char it. As the material
is to be molded into cylindrical or other forms, it must be
capable of melting at a moderate temperature (say between
250° and 330° F.). On the other hand, if the saponification
be not carried far enough, the material will be too soft and
will run at a lower temperature than is desired. In this
Mar 10/98 soap I ^{have} incorporated aluminium, which I have found to be the
metal best suited in all respects for the purpose. This
may be used in the form of aluminic hydrate, or in the metal-
lic state, powdered, or in small ingots. The method of
introducing the metal is moreover important, owing to the
tendency of sodium and aluminium when combined, to form crys-
Dec 27/17 tallizable compounds. Preferably the metal is first ~~dis-~~
May 19/18 ^{added to} ~~solved in~~ the soda lye, forming with a portion thereof alum-
May 4/98 inate of soda (sodium - ortho - aluminate, ~~Na₂Al₂O₆~~) which
readily unites with the stearic acid subsequently added. The
quantity of aluminium employed is relatively very small.

In order that the invention may be fully understood I
will give two formulas which have yielded the best results
obtained.

Formula A -

Stearic acid (free from oleic acid and glycerine)	408 lbs.
Aluminic Hydrate	7 lbs.
Caustic soda lye	85 lbs.

To this is added, for the purpose of "tempering", paraffin.

ozokerite, or similar material - 72 lbs.

Dec 27/97 The caustic soda is ^{incorporated} dissolved in water until a lye of 37.5° B. is obtained, and this is heated to its boiling point, about 242° F. The aluminic hydrate is added and ^{is quickly taken up by the lye} ~~quickly~~ dissolves. The stearic acid is melted and raised to about the same temperature, and the ^{compound of lye and aluminium} lye added slowly thereto. It will unite readily therewith. It is preferred to employ about the temperature indicated, as thereby the formation of the composition proceeds gradually and without violent ebullition. The temperature may subsequently be raised to about 300 F and continued at that heat until the water is all expelled. The composition is now completed except for the addition of a material such as paraffin, ozokerite, ^{or} ceresin, to bring it to the desired degree of hardness.

Formula B.

Stearic acid	300 lbs.
Powdered aluminium	1.5 lbs.
Caustic Soda lye (37.5 B)	9. lbs.
Sal soda dissolved in 12 gals. water	60. lbs.
Ceresin	60. lbs.

The sal soda lye and caustic soda lye may be united before the aluminium is added, or the latter may be added to the caustic soda, and the two liquids then united. Instead of powdered aluminium we ^{may} use ordinary ingot aluminium with results nearly if not equally as good.

After the material is moulded to the desired form it should be quickly cooled to ordinary temperatures.

Having thus described my invention what I claim as new
and desire to secure by Letters-patent is:

-1-

The process of making a sound-recording material, by
dissolving aluminium in soda lye, and adding the solution to
stearic acid, substantially as described.

-2-

*Cancelled
May 4/98*

See 27/97

The process of making a sound-recording material by
treating ^{pure} stearic acid with a ^{compound} solution of a metal such as alu-
minium ^{and} in caustic soda lye, substantially as described.

2 -3-

The process of making a sound-recording material by
melting stearic acid, free from glycerine and oleates, adding
thereto soda lye and aluminium, and heating the mass, sub-
stantially as described.

*Sub.
D.
May 19/98
5/16/98*

3 -4-

In the process of making a sound-recording material ~~in~~, the
~~in which a metal such as aluminium has been incorporated~~
improvement consisting in adding to stearic acid soda lye, in
such quantity as to produce partial saponification, and a
metal such as ~~aluminium~~, and heating the mixture, substantial-
ly as described.

4 -5-

The process of making a sound-recording material by
treating stearic acid with soda lye in quantity sufficient to
produce about a forty percent saponification, ^{the lye containing a metal} adding a metal
^{the mixture} and heating, substantially as described.

5 -6-

5/19/98

The process of making a sound-recording material by
forming a soda lye, heating to about its boiling ~~xxx~~ point,
^{adding} dissolving a small quantity of aluminium ^{therein}, heating pure
stearic acid to about the same temperature, adding the ^{compound of lye and aluminium} solu-
tion, and continuing the heating until the moisture is expelled,
substantially as described.

6 -7-

5/19/98

The process of making a graphophone tablet by forming
a soda lye, heating to about its boiling point, ^{adding} dissolving
a small quantity of aluminium ^{to} therein, heating pure stearic
acid to about the same temperature, adding the ^{compound} solution,
continuing the heating until the moisture is expelled, molding
into the desired shape and then quickly cooling, substantial-
ly as described.

7 -8-

The process of making a sound-recording material, by partial saponification of stearic acid with soda lye, ^{having} ~~containing~~ ^{mixed therewith} aluminium ~~in solution~~, substantially as described.

8 -9-

The process of making a sound recording material, by ^{adding} ~~dissolving~~ aluminic hydrate ^{to} ~~in~~ caustic soda lye, adding the ^{compound} ~~solution~~ to melted stearic acid, and ^{adding} ~~heating~~ the mixture, substantially as described.

9 -10-

The process of making a sound-recording material, by ^{adding} ~~dissolving~~ aluminium ^{to} ~~in~~ soda lye, adding the same to stearic acid, heating the mixture, and adding a softening material such as paraffin, substantially as described.

-11-

*Cancelled
may
4/98*
A composition of matter for a sound recording tablet, composed of stearic acid, caustic soda and aluminium, substantially as described.

-12-

*Pub.
le.
may
4/98*
A composition of matter for a sound recording tablet, composed of partially saponified stearic acid and aluminium, substantially as described.

-13-

*Granted
Dec 27/97*
A sound recording tablet composed of partially saponified stearic acid, aluminium, and a softening material, substantially as described.

-14-

*Granted
June 21/97*
A sound recording tablet composed of soda soap having aluminium incorporated therewith, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

Thomas H. Macdonald.

S. T. Cameron,)
Reeve Lewis.) Witnesses.

District of)
Columbia.) ss.

Thomas H. Macdonald the above named petitioner a citizen of the United States and resident of Bridgeport, Connecticut, being duly sworn, deposes and says that he verily believes himself to be the original, first and sole inventor of the improvement in the Manufacture of Graphophone Tablets described and claimed in the foregoing specification, that the same has not been patented to himself, or to others with his knowledge or consent, ~~except in the following countries~~ in any country that the same has not to his knowledge been in public use or on sale in the United States for more than two years prior to this application, and that he does not know and does not believe that the same was ever known or used prior to his invention thereof.

Thomas H. Macdonald.

Sworn to and subscribed before me this 25th day of
Nov., 1896.

Reeve Lewis.

(Notarial Seal).

Div. Room 221.
Communications should be addressed to
"The Commissioner of Patents,
Washington, D. C."

Paper No. _____
All communications respecting this
application should give the serial number,
date of filing, and title of invention.

J. E. H.

DEPARTMENT OF THE INTERIOR.

UNITED STATES PATENT OFFICE,

WASHINGTON, D. C.,

Dec. 29, 1896.

Thomas H. Macdonald,
Care Pollok & Mauro,
City.

Mailed " " "

Please find below a communication from the EXAMINER in charge of your application,

for Manufacture of Graphophone Tablets, filed Nov. 27, 1896, ser.
no. 613,615.

John S. Seymour
H. J. Allen
Commissioner of Patents.

Claims 1, 2, 3, 4, 5, 8, 9, 11, 12, 13 and 14 are
rejected on the patent to Edison, #414,759, Nov. 12, 1889, Acoustics:
Graphophone Tablets. If applicant can point out any advantages
or peculiarities of his processes over the patent, he should do so.

W. B. H.

J. T. Newton Ex

Room 221.
 Thomas H. Macdonald.
 Filed Nov. 27th, 1896.
 Sr.No. 613,615.
 Manufacture of Graphophone Tablets.

Hon. Commissioner of Patents,

Sir:

Add the following claim:

~~15~~ "15." The process of making a sound-recording material by adding aluminate of soda to stearic acid and heating the mixture, substantially as described."

REMARKS.

We have examined the reference cited against certain claims of this application (Edison No. 414,759) and are unable to find therein a disclosure of any feature of applicant's invention. In fact the patent does not describe any method of making a sound recording material, or any definite composition. The specification is wholly defective in that it lacks all reference to proportions of ingredients and other essential indications. The composition used as a surface coating is vaguely referred to as made by "combining with the stearate of a metal, an oleate of a metal", and in another place the addition of oleate of alumina to monostearate of soda is referred to. Applicant employs as the principal ingredient pure stearic acid and particularly points out that the presence of oleates or oleic acid is detrimental.

The advantages of the special composition produced by applicant, are fully pointed out in the specification, and the state of the prior art is acknowledged on pages 1 and 2.

We find ourselves at a loss to discuss the official action in detail, not understanding by what construction of the reference the Examiner finds in it the subject-matter of the several claims. In case of further adverse action, we request a more definite reference to the parts of the Edison specification which the Examiner regards as anticipating the claims.

Respectfully,

Pollok & Mauro.

Attorneys.

Washington, D.C.

June 19th, 1897.

2-260.

Div. Room 221
 All communications should be addressed to
 "The Commissioner of Patents,
 Washington, D. C."

Paper No.
 All communications respecting this
 application should give the serial number,
 date of filing, and title of invention.

J. P. H.

DEPARTMENT OF THE INTERIOR

UNITED STATES PATENT OFFICE,

WASHINGTON, D. C.,

July 19, 1897.

Thomas H. Macdonald,
 Care Pollok & Mauro,
 City

Mailed " " "

Please read below a communication from the EXAMINER in charge of your application.
 for Manufacture of Graphophone Tablets, filed Nov. 27, 1896, ser.
 no. 613,615.

Benj Butterworth
B. J. Allen
 Commissioner of Patents.

This entire application has been reviewed in view of the applicant's argument of June 21, 1897, and it is found that the specification is not altogether clear. For instance, the expression on page 3, lines 1 and 2, would be clearer if the words of alkali were substituted after the word "quantity" in line 2.

In the expression beginning in line 14 and ending at the period on line 16, one would infer that the soda lye and stearic acid were mixed before the aluminium were incorporated. Such however is not the case.

The use of the word "dissolved" in line 21, same page and in other parts of the specification as line 5, next page, is improper. The metal is not dissolved in the soda lye but forms therewith ~~and~~ a definite chemical compound. The word "lye" in line 6, page 4, should be changed to "the compound" of soda lye and aluminium.

The word or should be inserted after the word ozokerite, line 13, page 4.

Claim 2 is still believed to be met in patent to Edison of record. It is true that Edison states that he adds an oleate of a metal to the compound of soda lye and stearic acid but merely

#613,615.

to omit the oleate would not be invention.

Claim 4 is not clear. One would infer from that claim that the stearic acid and soda lye was first combined and then aluminium added to the combination. It is not believed that such process however is possible because the soda lye being all taken up by the stearic acid it is exceedingly doubtful if the aluminium would chemically combine with such a compound, see Roscoe and Schorlenmer treatise on Chemistry, published by Appleton & Co., # 1, 3 and 5 Bond Street, New York, 1892, a copy of which may be seen in the Room of the Examiner of Division 31. (Claim 5 is subject to the same criticism, moreover that claim is for a different invention from claim 1.)

Claims 11, 12, 13 and 14 are rejected on the patent to Edison, on the ground that it would not be invention to leave out the oleate which Edison states he uses.

7

J. T. Newton Ex

J. T. N.

--:IN THE UNITED STATES PATENT OFFICE:--

Room 221..
Thomas H. Macdonald.
Filed Nov. 27th, 1896.
Sr. No. 613,615.
Manufacture of Graphophone Tablets.

Hon. Commissioner of Patents,

Sir:

Please amend as follows:

Page 3, line 2 after "quantity" insert "of alkali",
line 21 change "dissolved" to "incorporated".

Page 4, line 2, change "dissolved" to "incorporated".
Line 4 erase "quickly dissolves" and substitute "is quickly
taken up by the lye".

Page 4, line 6 erase "lye" and substitute "compound of
lye and aluminium"

Page 4, line 13 after "ozokerite" insert "or"
Claim 2, before "stearic" insert "pure", change
"solution" to "compound", and "in" (line 3) to "and".

Erase claim 14 and change 15 to 14.

The amendment is made in view of official letter of
July 19th.

The inference suggested by the examiner could hardly be
drawn from the passage beginning line 14, page 3, because
the method of introducing the aluminium is described in the
very next sentence. Neither is there any want of clearness
in claim 4. The Examiner is probably correct in thinking
that the metal could not be incorporated after combining
the stearic acid and lye. Assuming that to be true, there
would be no reason to infer from the claim an impossible oper-
ation when the specification describes that which is practicable.

Of course, applicant is not limited to any particular
order in combining the ingredients, except by what is prac-
ticable.

The Examiner construes Edison's patent as an anticipation of certain claims on the theory that "to omit the oleate would not be invention". We agree to that and indeed it is not necessary to argue this because Edison's patent expressly says that the oleate may be omitted.

When the oleate is omitted we have simply "the stearate of a metal". This being true, the Examiner must construe the rejected claims as covering simply a recording blank composed of stearate of a metal. Not only is there no such claim in the case, but applicant points out that most of the metallic salts give rise to hygroscopic compounds, and would therefore be unsuitable. He says "This is particularly true of the stearates and acetates". (page 2, line 9).

Referring to the claims in detail, claim 2 specifies treating stearic acid with a compound of a metal, such as aluminium, and caustic soda lye. This process is certainly not disclosed in the phrase "stearate of a metal".

Claim 11 covers a definite composition of stearic acid, caustic soda, and aluminium. No such composition is defined by the phrase quoted above. Claims 12 and 13 are limited to the more specific composition of "partially saponified stearic acid".

Reconsideration is requested.

Respectfully,

Pollok & Mauro

Washington, D.C.

Attorneys.

December 24th, 1897.

2-260.

Div. _____ Room 221
 All communications should be addressed to
 "The Commissioner of Patents,
 Washington, D. C."

Paper No. _____
 All communications respecting this
 application should give the serial number,
 date of filing, and title of invention.

J. H. D.

DEPARTMENT OF THE INTERIOR,

UNITED STATES PATENT OFFICE,

WASHINGTON, D. C.,

March 8, 1898.

Thomas H. Macdonald,
 Care Pollok & Mauro,
 City

Mailed " " "

Please find below a communication from the EXAMINER in charge of your application,

for Manufacture of Graphophone Tablets, filed Nov. 27, 1896, serial
 no. 613,615.

G. H. Duell
G. H. Duell
 Commissioner of Patents.

This application has again been carefully considered in view
 of the applicant's last letter and amendments. The examiner still
 thinks that the expression beginning at line 14 and ending at the
 period of line 16 on page 3, is confusing. The necessary inference
 from that expression is that the caustic alkalye and the stearic
 acid are made into a soap and afterwards aluminium incorporated
 therein. This expression however could be rendered clear by in-
 serting the word have before the word "incorporated" in line 15.

Claim 2 is still thought to be met in Edison of record and is
 rejected.

In lines 8 and 9, page 2, of the Edison specification, he
 speaks of using monostearate of soda as a sound recording blank.
 The natural way and to the Examiner, the only practical way of mak-
 ing monostearate soda is to treat stearic acid with a compound of
 a metal.

The former objections to claims 4 and 5 are repeated.

Claims 11 and 12 are rejected on the patent to Edison.

Applicant is requested to file a drawing in this case showing
 a conventional phonogram blank suitably marked as containing soda
 lye and a stearate of aluminium. This to be used in searches and
 examinations in case the application results in a patent.

J. T. N.

J. T. Newton Ex

--:IN THE UNITED STATES PATENT OFFICE:--

Room 221.
Thomas H. Macdonald.
Filed Nov. 27th, 1896.
Sr. No. 613,615.
Manufacture of Graphophone Tablets.

Hon. Commissioner of Patents,

Sir:

Please amend the above entitled application as follows:

Page 2, after line 19 insert:

73. "The accompanying drawing illustrates a common form of tablet for use in receiving engraved records of sounds".

Page 3, line 15, ~~after~~ ^{before} "incorporated" insert "have"

Claim 4, after "soda lye" line 2 insert

"in which a metal such as aluminium has been incorporated".

Erase "and a metal such as aluminium".

Claim 5 erase "adding a metal" and substitute "the lye containing a metal,". After "heating" insert "the mixture".

REMARKS.

We are in receipt of official letter of the 8th inst. and file herewith a drawing such as called for. The requirement that the tablet be marked as containing soda lye and stearate of aluminium indicates that we have not yet succeeded in making it clear that applicant does not use, but on the contrary avoids the use of, stearates.

We must ask further consideration of claim 2, as last amended. In rejecting this claim the Examiner refers to the statement in Edison's patent that monostearate of soda may be used, and says that the only practical way of making monostearate of soda is to treat stearic acid with a compound of a metal

The only metal that can make monostearate of soda is

sodium. The claim calls for a metal such as aluminium and caustic soda lye. We are still unable to comprehend how the Examiner reads this process in the phrase "monostearate of soda". We respectfully ask explanation on this point.

In respect of claims 11 and 12 we ask the Examiner to point out in the patent cited any reference to caustic soda, saponification, or partial saponification, and particularly to indicate where he finds the specific mixture of stearic acid, caustic soda, and aluminium. We are unable to find these matters in the reference, and are persuaded there is a misapprehension of the reference either by the Examiner or by ourselves.

Very respectfully, 22

Washington, D.C.

Pollok & Mauro

March 15th, 1898.

Attorneys.

--:IN THE UNITED STATES PATENT OFFICE:--

Room 221.
Thomas H. Macdonald.
Filed November 27th, 1896.
Sr. No. 613,615.
Manufacture of Graphophone Tablets.

Hon. Commissioner of patents,

Sir:

Please amend the above entitled application by inserting the words "of lead" after "acetates" line 9, page 2.

REMARKS.

Since our last communication we have reviewed this case with the inventor and find that we have fallen into an error of fact which, while it has no bearing upon the patentability of the invention, should be corrected. We have several times stated in our letters to the office that the applicant avoids the use of all stearates. This was an error, the reference on page 2, line 9 of the specification being intended to apply to lead ~~stearate~~ salts. Applicant does in fact, use stearate of aluminium.

This does not affect the patentability of any claim inasmuch as each of the claims heretofore rejected is for a specific composition not specified in Edison's patent, which in fact gives no sufficient indications for making a graphophone tablet. The patent suggests the use of two things (1) a mixture of the stearate of a metal with the oleate of a metal, (2) monostearate of soda. Neither of these is what applicant claims, and neither is used, or could be practically used for applicant's purpose.

Respectfully,

Wash. D.C.

Pollok & Mauro

March 21st, 1898.

Attys.

Div. Room 221
 All communications should be addressed to
 "The Commissioner of Patents,
 Washington, D. C."
 J. R. D.

Paper No. _____
 All communications respecting this
 application should give the serial number,
 date of filing, and title of invention.

21

DEPARTMENT OF THE INTERIOR.

UNITED STATES PATENT OFFICE,

WASHINGTON, D. C.,

April 16, 1898.

Thomas H. Macdonald,
 Care Pollok & Mauro,
 City.

Mailed " " "

Please find below a communication from the EXAMINER in charge of your application.

for Manufacture of Graphophone Tablets, filed Nov. 27, 1896, serial
 number 613,615.

C. H. Duell

C. H. Duell
 Commissioner of Patents.

The formula for the aluminate of soda given
 on line 23 of page 3, is found not to agree with Wurlz's chemistry,
 Vol. 1, page 171 (a copy of which may be seen in Division 31 of
 this Office) the formula there given is $\text{Na}_6 \text{Al}_4 \text{O}_9$.

The claims 2, 11, 12 and 13 are still thought to be fairly
 met in Edison cited. Moreover claim 2 can hardly be construed as
 a process. The only step set forth in the alleged process is
 "treating" certain ingredients. Just what that means is not clear.
 If there is anything patentable in this claim, it is in the
 ingredients used. But Edison discloses a phonogram blank made of
 Monostearate of soda = Stearic Acid and Caustic Soda and Oleate
 of Alumina = Oleic Acid and Aluminium. Applicant claims a
 composition which differs from Edison in that he uses Aluminium
 with his Monostearate of Soda while Edison uses Oleate of
 Alumina with Monostearate of Soda. These claims are not believed
 to set forth a patentable difference. The form of claims 11,
 12 and 13 is moreover objectionable. When the ingredients
 mentioned in these claims are brought together to form a composi-
 tion of matter they will not remain in that form e.g. the
 Aluminium and Soda will combine and will become Aluminate of
 #613,615.

Soda, the Stearic Acid and some of the Soda will combine and
 become the Stearate of Soda etc. As regards claim 13, Oleic
 Acid is a softening material and Edison's composition which
 contains Stearic Acid, Soda, Aluminium and Oleic Acid, meets this
 claim.

The above mentioned claims are again rejected.

J. T. Newton Ex

J. T. N.

--:IN THE UNITED STATES PATENT OFFICE:--

Room 221.
Thomas H. Macdonald.
Filed November 27th, 1896.
Sr. No. 613,615.
Manufacture of Graphophone Tablets.

Hon. Commissioner of Patents,

Sir: Please amend the above entitled
application as follows:

Page 3, line 23 strike out "Na6 Al2 O6".

Erase claim 2, and change the numerals of claims 3 - 10
to 2 - 9, respectively.

Erase claims 11, 12 and 13 and substitute:

le "10. A composition of matter for a sound-recording tablet
formed of pure stearic acid (free from oleic acid and gly-
cerine) partly saponified by caustic soda, and having alumin-
ium incorporated therein, substantially as described."

Change claim 14 to 11.

Respectfully,

Washington, D.C.

Pollok & Mauro

May 3rd, 1898.

Attorneys.

--:IN THE UNITED STATES PATENT OFFICE:--

Room 221.
Thomas H. Macdonald.
Filed November 27th, 1896.
Sr. No. 613,615.
Manufacture of Graphophone Tablets.

Hon. Commissioner of Patents,

Sir:

At the suggestion of the Examiner
we hereby amend as follows:

Page 3, lines 21 and 22 change "incorporated in" to
"added to".

Erase claim 3 (original 4) and substitute:

"3. In the process of making a sound-recording material,
the improvement consisting in adding to stearic acid soda lye
with which a metal such as aluminium has been united in such
quantity as to produce partial saponification, and heating
the mixture, substantially as described."

Claim 5, line 3 erase "dissolving" and insert "adding".
same line change "therein" to "thereto".

Lines 4 and 5 change "solution" to "ammoniacal compound
of lye and aluminium".

Claim 6, line 2 change "dissolving" to "adding", line
3 change "therein" to "thereto", and line 4 change "solution"
to "compound".

Claim 7 Line 3, ^{for} ~~after~~ "containing" ~~insert~~ substitute
"having". Line 3 after "aluminium" erase "in solution" and
insert "united therewith".

Claim 8, lines 1 and 2 erase "dissolving" and substitute
"adding". Line 2 change "in" to "to". Line 3 change
"solution" to "compound".

Claim 9, line 2 erase "dissolving" and insert "adding".
same line change "in a" to "to"

Respectfully,

Pollok & Mauro

Washington, D.C.

Attorneys.

May 17th, 1898.

ISSUE DIVISION.

All communications should be addressed to
"The Commissioner of Patents,
Washington, D. C."

Serial No. 613615

DEPARTMENT OF THE INTERIOR,

United States Patent Office,

Washington, D. C., June 3, 1898.

Thomas H. Macdonald

c/o Pollok & Mauro

City

SIR:

Your APPLICATION for a patent for an IMPROVEMENT IN

Manufacture of Graphophone Tablets

filed Nov 27, 1896, has been examined and ALLOWED.

The final fee, Twenty Dollars, must be paid, and the Letters Patent bear date as of a day not later than SIX MONTHS from the date of this present notice of allowance.

If the final fee is not paid within that period the patent will be withheld, and your only relief will be by a renewal of the application, with additional fees, under the provisions of Section 4897, Revised Statutes. The office aims to deliver patents upon the day of their date, and on which their term begins to run; but to do this properly applicants will be expected to pay their final fees at least TWENTY DAYS prior to the conclusion of the six months allowed them by law. The printing, photolithographing, and engrossing of the several patent parts, preparatory to final signing and sealing, will consume the intervening time, and such work will not be done until after payment of the necessary fees.

When you send the final fee you will also send, DISTINCTLY AND PLAINLY WRITTEN, the name of the INVENTOR and TITLE OF INVENTION AS ABOVE GIVEN, DATE OF ALLOWANCE (which is the date of this circular), DATE OF FILING, and, if assigned, the NAMES OF THE ASSIGNEES.

If you desire to have the patent issue to ASSIGNEES, an assignment containing a REQUEST to that effect, together with the FEE for recording the same, must be filed in this office on or before the date of payment of final fee.

Additional copies of Specifications and Drawings will be charged for at the following rates: Single Copies, uncertified, 10 cents each. The money should accompany the order.

Very respectfully,

C. H. Tuell

Commissioner of Patents.

After allowance, and prior to payment of the final fee, applicants should carefully scrutinize the description to see that their statements and language are correct, as mistakes not incurred through the fault of the office, and not affording legal grounds for reissues, will not be corrected after the delivery of the letters patent to the patentee or his agent.

AMOUNT RECEIVED
 \$ 20
 CHIEF CLERK.

2-327.

MEMORANDUM
 OF
 FEE PAID AT UNITED STATES PATENT OFFICE.

(Be careful to give correct Serial No.)

Serial No. 613615, 190 1898.

INVENTOR:

T. H. Macdonald

PATENT TO BE ISSUED TO

American Graphophone Co.

NAME OF INVENTION, AS ALLOWED:

Mfg. of Graphophone Tablets

DATE OF PAYMENT:

June 11, 1898

FEE:

\$20.00

DATE OF FILING:

Nov. 27, 1897

DATE OF CIRCULAR OF ALLOWANCE:

June 3, 1898

The Commissioner of Patents will please apply the accompanying fee as indicated above.

Pollok & MauroAttorney.

SEND PATENT TO

Pollok & MauroCity

Note: Assignment filed June 11/98

DIV. XXIII.
(Serial Number,)

1 8 9 6

DIV.
(Ex'r's Book,)

4/36/5
Patent No. 606725

11
1375-----

Thomas H. Macdonald

Assor to the American Graphophone Company, of Washington D.C.
(Corp. of W. Va.)

Of Bridgeport

County of

State of Connecticut

Invention

Manufacture of Graphophone Tablets.

Parts of application filed	(Petition	Nov 27-	1896
	(Affidavit	" "	"
	(Specification	" "	"
	(Drawing 1 sheet made 16/98		
	(Model None		
	(Specimen		
	(First fee Cash \$15.	Nov 27-96.	
	" " Cert.		

App. filed complete Nov 27-96

Examined June 1, 98. J. T. Newton Ex

Countersigned: J W Babson
6, 2. 98 For Commissioner.

Notice of allowance June 3, 1898.

Final fee Cash \$20 June 11, 1898.

" " Cert. , 189 .

Patented July 5, 1898.

3

3/

Pollok & Mauro

City.

181. ACOUSTICS.
Graphophoné, Tablets.

1 8 9 6

C O N T E N T S:

$\frac{1}{2}$ Application / papers.

1. Rej Dec 29, 1896.
2. *Amndt. A. June 21/97.*
3. Rej: July 19, 1897.
4. *Dec. 27/97 Ammendt.*
5. Rej. Mch. 8. 1898
6. *Ammendt. B. Mar. 16/98*
7. *Ammendt. Mar. 21/98*
8. Rej. Apl. 16 98
9. *Amndt. C. May 4/98*
10. " D " 27 "
- 11.
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- 13.
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- 21.
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- 23.

T I T L E: 32

Improvement in Manufacture of Graphophone Tablets

No. 606,725.

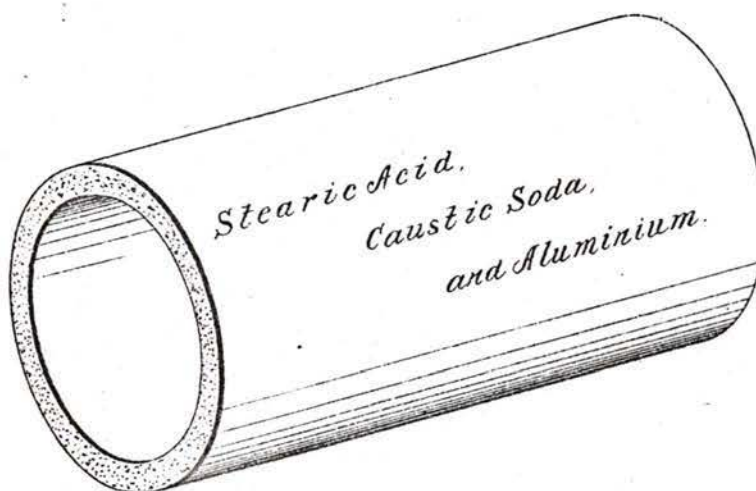
Patented July 5, 1898.

T. H. MACDONALD.

MANUFACTURE OF GRAPHOPHONE TABLETS.

(Application filed Nov. 27, 1896.)

(No Model.)



Witnesses.

H. R. Edison.

R. L. Lewis.

Inventor

Thomas H. Macdonald,
by Edward M. Mawer,
his attorney.

UNITED STATES PATENT OFFICE.

THOMAS H. MACDONALD, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO
THE AMERICAN GRAPHOPHONE COMPANY, OF WASHINGTON, DISTRICT
OF COLUMBIA.

MANUFACTURE OF GRAPHOPHONE-TABLETS.

SPECIFICATION forming part of Letters Patent No. 606,725, dated July 5, 1898.

Application filed November 27, 1896. Serial No. 613,615. (No specimens.)

To all whom it may concern:

Be it known that I, THOMAS H. MACDONALD, of Bridgeport, Connecticut, have invented new and useful Improvements in the Manufacture of Graphophone-Tablets, which improvements are fully set forth in the following specification.

This invention relates to the manufacture of tablets or blanks adapted to receive engraved records of sounds, and more particularly to the composition of matter of which the tablet is composed.

The recording material in order to answer well the requirements of the engraving method of recording sounds should be perfectly amorphous, slightly cohesive, and capable of being removed cleanly and smoothly in chips or shavings under the action of the recording-stylus when actuated by the feeble force of sound-waves. The material, moreover, should be sufficiently hard to withstand ordinary handling, to retain perfectly its form, and to resist the effect of ordinary changes of temperature. It should also be a stable compound or material in order that records made in it may be preserved for indefinite lengths of time.

As pointed out in Letters Patent No. 341,214, granted May 4, 1886, to C. A. Bell and S. Tainter, the properties above indicated reside in a greater or less degree in wax and wax-like substances—such as beeswax, paraffin, stearin, &c.—though by special preparation of these and similar substances their fitness for the purpose in view has been increased.

It has been heretofore proposed to use as a sound-recording material an insoluble soap made by saponification of any fatty acid by means of an earthy alkali, such as lime. It has also been proposed to employ a metal, such as lead, combined with stearic or oleic acid, and particularly a mixture of oleate and stearate of lead; but tablets made of insoluble lime-soap or of stearates or oleates of lead have never yielded commercially-successful results. Several practical difficulties have been encountered in endeavoring to make tablets composed wholly or in part of soap. The chief difficulty has been that the surfaces of

such tablets become coated after a greater or less length of time with a bluish film having the appearance of mold and which has been termed "efflorescence." This is due to the presence in the material of hygroscopic compounds, which on being attacked by moisture work out to and spread upon the surface of the tablet.

I have found that lead in any form, as well as most of the salts of other metals which might be otherwise suitable for the purpose in view, give rise to hygroscopic compounds. This is particularly true of stearates and acetates of lead. Another difficulty that arises is the formation of crystalline or crystallizable compounds in the operation of making soap. The object of introducing a metal (or metallic salt) is to prevent all tendency to crystallization, it being of the first importance to secure a composition which shall be and under all conditions remain perfectly amorphous and presenting equal resistance to cutting in every direction. All ordinary commercial soaps have this tendency to crystallization in some degree, it not being possible to introduce sufficient sodium or soda salt to prevent all crystallization.

The accompanying drawing illustrates a common form of tablet for use in receiving engraved records of sounds.

In carrying out my invention, whereby all the conditions herein pointed out as essential are secured, I take stearic acid as nearly pure as can be obtained and convert it into soda soap in the manner hereinafter explained. The composition, however, differs from ordinary soap in that it contains no oleates, I having found that the presence of even a small quantity of oleate or oleic acid is detrimental. It is also important that the tallow or other source from which the stearic acid is obtained be completely deglycerinized. Except under these conditions the result will be unsatisfactory.

In converting the stearic acid into soap I produce only a partial saponification—that is to say, instead of using the chemical equivalent in caustic alkali of the fat acid I use about forty per cent. of that quantity of alkali—

thus producing what may be called a soap of about two-fifths saponification. This is the proportion which gives the best results, but is of course variable within limits. The controlling consideration is that the greater the quantity of alkali the higher will be the melting-point of the resulting soap, and a complete saponification will produce a soap which requires to melt at a temperature which will char it. As the material is to be molded into cylindrical or other forms, it must be capable of melting at a moderate temperature, say between 250° and 330° Fahrenheit. On the other hand, if the saponification be not carried far enough the material will be too soft and will run at a lower temperature than is desired. In this soap I have incorporated aluminium, which I have found to be the metal best suited in all respects for the purpose. This may be used in the form of aluminic hydrate or in the metallic state, powdered, or in small ingots. The method of introducing the metal is, moreover, important, owing to the tendency of sodium and aluminium when combined to form crystallizable compounds. Preferably the metal is first added to the soda-lye, forming with a portion thereof aluminate of soda, (sodium-ortho-aluminate,) which readily unites with the stearic acid subsequently added. The quantity of aluminium employed is relatively very small.

In order that the invention may be fully understood, I will give two formulas which have yielded the best results obtained.

35 Formula A: Stearic acid, free from oleic acid and glycerin, four hundred and eight pounds; aluminic hydrate, seven pounds; caustic-soda lye, eighty-five pounds. To this is added, for the purpose of "tempering," 40 paraffin, ozokerite, or similar material, seventy-two pounds. The caustic soda is incorporated in water until a lye of 37.5° Baumé is obtained, and this is heated to its boiling-point, about 242° Fahrenheit. The aluminic hydrate is added and is quickly taken up by the lye. The stearic acid is melted and raised to about the same temperature and the compound of lye and aluminium added slowly thereto. It will unite readily therewith. It 50 is preferred to employ about the temperature indicated, as thereby the formation of the composition proceeds gradually and without violent ebullition. The temperature may subsequently be raised to about 300° Fahrenheit and continued at that heat until the water is all expelled. The composition is now completed except for the addition of a material such as paraffin, ozokerite, or ceresin to bring it to the desired degree of hardness.

60 Formula B: Stearic acid, three hundred pounds; powdered aluminium, 1.5 pounds; caustic-soda lye, 37.5° Baumé, nine pounds; sal-soda dissolved in twelve gallons of water, sixty pounds; ceresin, sixty pounds. The 65 sal-soda lye and caustic-soda lye may be united before the aluminium is added, or the

latter may be added to the caustic soda and the two liquids then united. Instead of powdered aluminium I may use ordinary ingot-aluminium with results nearly if not equally as good. After the material is molded to the desired form it should be quickly cooled to ordinary temperatures.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The process of making a sound-recording material, by dissolving aluminium in soda-lye, and adding the solution to stearic acid, substantially as described. 80

2. The process of making a sound-recording material by melting stearic acid, free from glycerin and oleates, adding thereto soda-lye and aluminium, and heating the mass, substantially as described. 85

3. In the process of making a sound-recording material, the improvement consisting in adding to stearic acid soda-lye with which a metal such as aluminium has been united in such quantity as to produce partial saponification, and heating the mixture, substantially as described. 90

4. The process of making a sound-recording material by treating stearic acid with soda-lye in quantity sufficient to produce about a forty-per-cent. saponification, the lye containing a metal and heating the mixture, substantially as described. 95

5. The process of making a sound-recording material by forming a soda-lye, heating to about its boiling-point, adding a small quantity of aluminium thereto, heating pure stearic acid to about the same temperature, adding the compound of lye and aluminium and continuing the heating until the moisture is expelled, substantially as described. 105

6. The process of making a graphophone-tablet by forming a soda-lye, heating to about its boiling-point, adding a small quantity of aluminium thereto, heating pure stearic acid to about the same temperature, adding the compound, continuing the heating until the moisture is expelled, molding into the desired shape and then quickly cooling, substantially as described. 115

7. The process of making a sound-recording material, by partial saponification of stearic acid with soda-lye having aluminium united therewith, substantially as described. 120

8. The process of making a sound-recording material, by adding aluminic hydrate to caustic-soda lye, adding the compound to melted stearic acid, and heating the mixture, substantially as described. 125

9. The process of making a sound-recording material, by adding aluminium to soda-lye, adding the same to stearic acid, heating the mixture, and adding a softening material such as paraffin, substantially as described. 130

10. A composition of matter for a sound-recording tablet formed of pure stearic acid (free from oleic acid and glycerin) partly

606,725

3

saponified by caustic soda, and having aluminium incorporated therein, substantially as described.

11. The process of making a sound-recording material by adding aluminate of soda to stearic acid and heating the mixture substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

THOMAS H. MACDONALD.

Witnesses:

S. T. CAMERON,
REEVE LEWIS.

"Defendant's Exhibit, Aylsworth Notebook No. 564."

NOTES.

I. The following experiments were made between the dates Jan. 1, 1887 and the ones given for some of them here and there. So to locate the date of any one the ones nearest, either forward or backward must be taken and the position it occupies between the two, will tell pretty nearly at what time the experiment was made. 2

II. Sample results of a great many of these experiments were saved and especially of the ones whose results are not recorded, with the idea that a sample of material that can be referred to is far better than any description of the substance would be.

III. The following experiments are copied from rough notes made at the time of the experiment; and in regular order as to time. 3

EXPERIMENTS ON PHONOGRAPH WAX.

At this time, Paraffine 100, Carnauba 30, was used. Commencing Jan. 1, 1887. 100 grm. of Paraffine as a base.

No. of
Experiment

Carnauba 10

4

1

" 12

" 14

" 16

" 18

" 20

" 22

" 24

" 26

" 28

" 30 * Regular

5

Carnauba 32

" 34

" 36

" 38

" 40 great contraction.

2 Spirits Turpentine..... 10

Carnauba..... 60

3 Carnauba..... 40

Linseed Oil..... 10

6 4 Carnauba..... 30

Burgandy pitch..... 10

Paraffine 100

5 Burgandy pitch..... 10

6 " "..... 20

7 " "..... 30

8 " "..... 40

9 Carnauba 50.. Venice Turpen-

tine..... 10

10 Carnauba 50.. Glycerine.. 10

7 11 Carnauba..... 60

Sticky solid, boiled, Linseed

Oil..... 15

12 Myrtle Wax..... 40

13 " "..... 50

14 Shellac..... 30

15 Paraffine was boiled 4 hours,

little harder, darkened, no

good.

16 Gum Thus..... 50 fair, rather soft.

5

17 Alpha naphthol { 10
20 { Good, but the naphthol evap-
30 { orates, scratches some.
4018 Beta Naphthol..... { 10
20 } not as good as
30 } alpha.
40

19 Napthalene..... 100

19½ Anthrocene..... 100

Cerasin—100 grm. as a
base.

			9
20	Canauba.....	5	
21	".....	10	
22	".....	20	
23	".....	30	{ "Bang up" can be molded, no scratch scarce- ly. Mr. Edison adopts it as regular.
24	".....	40	
25	Shellac.....	30	{ Good cut but has great contrac- tion more scratchy than regular.
26	".....	40	
27	Myrtle Wax.....	40	
28	Gum Thus.....	40	
29	Paraffine.....	100	
30	White Bees Wax.....	100	
31	Japan Wax.....	100	
32	Stearic Acid.....	100	{ Rather hard, fairly good.
	Cerasin—100		
33	Crude Japan Wax.....	100	
34	" Bees Wax.....	100	
35	Sperniceti.....	100	
36	Alpha Naphthol.....	20	
37	".....	30	
38	".....	40	{ good but not as hard as No. 17, less scratch
39	Beta.....	35	
40	".....	50	
41	Napthaline.....	30	12
42	".....	40	
43	".....	50	
44	Anthracene.....	40	
45	".....	50	
46	Dextarine.....	20	
47	".....	30	Does not mix
48	Reg. Wax No. 23.....	100	
	Lamp Black.....	50	
49	Reg. Wax.....	100	
	Oxide Zinc.....	50	
	Cerasin—100		

13

50	Spermaceti	10
51	"	20
52	"	30
53	"	40

54	Carnauba	30
	Spermaceti	13

55	Carnauba	30
	Spermaceti	26

56	Carnauba	30
	Spermaceti	39

57	Carnauba	30
14	Stearic Acid	26

58	Kaolin	20
----	--------	----

59	"	30
----	---	----

60	"	40
----	---	----

61	"	50
----	---	----

62	"	75
----	---	----

63	"	100
----	---	-----

64	Carnauba	30
----	----------	----

	Guttapercha in Chloroform	10
--	---------------------------	----

Cearsin—100

65	Gum Mastic	20
----	------------	----

66	"	40
----	---	----

15	67	Resin	20
----	----	-------	----

68	"	40
----	---	----

69	Gum Anime	20
----	-----------	----

70	"	40
----	---	----

71	Gum Olibanum	20
----	--------------	----

72	"	40
----	---	----

73	Dragonis Gum	20
----	--------------	----

74	"	40
----	---	----

75	Cocoa Butter	20
----	--------------	----

76	Gum Elime	20
----	-----------	----

77	"	40
----	---	----

16	78	" Guaic	20
----	----	---------	----

79	"	40
----	---	----

80	Asphaltum	20
----	-----------	----

81	"	30
----	---	----

82	"	40
----	---	----

83	"	50
----	---	----

CERASIN 100.

84	Gum Chicle	20
----	------------	----

85	"	40
----	---	----

86	Gum Galbanum	20	17
87	" "	40	
88	" Euphorbium	20	
89	" "	40	
90	Cerasin is boiled down—somewhat harder than usual, colored considerable.		
91	Gum Sandarach	15	
92	" "	30	
93	" Kauri	10	
94	" "	20	18
95	" "	30	
96	" Dammar	20	
97	" "	40	
98	" Ammonium	30	

CERASIN 100.

99	Carbonate Soda	no definite proportions.	
100	" Lead		
101	" Zinc		19
102	" Magnesia		
103	" Strontium		
104	" Barium		
105	" Tin		
106	Oxide Lead		
107	" Tin		
108	" Mercury		
109	" Zinc		
110	" Iron		
111	" Alumina		20
112	" Antimony		
113	" Arsenic		

CERASIN 100.

114	Chloride Soda	no definite %
115	" Zinc	"
116	" Lead	"
117	" Ammonia	"
118	" Tin	"
119	" Antimony	"
120	" Iron	"

21

121	Acid Phosphoric	no definite %
122	" Wolframic	"
123	" Hydrochloric	"
124	" Tannic	"
125	" Boracic	"
126	" Chromic	"
127	" Succinic	"
128	" Oleic	"

22

129	Syrian Asphalt	50
130	" "	60
131	" "	70
132	Soft Mexican Asphalt	100
133	Hard " "	100
134	" " "	50
135	Purified Trinidad	50
136	" "	60
137	Bitumen	60
138	Bitumen	50
139	Sulphur	10
140	"	20
141	"	30

23

WHITE WAX 100 BASE.

146	Carnauba	10
147	"	15
148	"	20
149	"	25
150	"	30
151	"	31
152	"	32
153	Shellac	10
154	"	20
155	"	30
156	Myrtle Wax	10
157	"	20
158	"	30
159	"	40
160	Gum Thus	20
161	" "	30
162	" "	40

24

{ Good, very small
scratch, some-
what electrical
and draggy.

			25
163	Paraffine.....	100	
164	Japan Wax.....	100	
165	Crude Japan Wax.....	100	
166	Spermacetti.....	20	
167	".....	30	
168	".....	40	
169	".....	50	
170	Stearic Acid.....	10	
171	" ".....	20	
172	" ".....	30	26
173	" ".....	40	
174	Palmitic Acid.....	30	
175	Tannic ".....	30	
176	" ".....	40	
177	Succinic ".....	30	
178	" ".....	50	
179	Glue.....	30	does not mix
180	Crude Ozokerite.....	50	
181	" ".....	100	
182	Caramel.....	30	27
183	Licorice.....	20	
184	".....	30	
185	Cocoa Butter.....	20	
186	" ".....	40	
187	" ".....	50	
188	Reg. Wax. No. 23.....	50	
	Vaseline.....	10	
189	Reg. Wax No. 23.....	50	
	Roofers Pitch.....	10	
190	Reg. No. 23.....	50	28
	Roofers Pitch.....	20	
191	Reg. No. 23.....	50	
	Soft Tar.....	10	
192	Reg. No. 23.....	50	
	Soft Pitch.....	20	
193	Reg. No. 23.....	30	
	Kaolin White.....	20	
194	Reg. No. 23.....	30	
	Kaolin White.....	30	
195	Reg. No. 23.....	50	
	Solid Chloride zinc.....	10	

29	195 $\frac{1}{2}$	Reg. No. 23.....	50
		Phosphoric Anhydride...	10
	196	Reg. Wax No. 23.....	50
		Solid K. H. O.....	10
	197	Reg. No. 23.....	50
		Anthracene.....	10
	198	Reg. No. 23.....	50
		Napthalene.....	10
	199	Chicle.....	5
30	200	Chicle.....	10
	201	".....	15
	202	".....	20
	203	".....	30
	204	Reg. No. 23.....	10
		Chicle.....	5
	205	Reg. No. 23.....	20
		Chicle.....	5
	206	Reg. No. 23.....	30
		Chicle.....	5
31	207	Reg. No. 23.....	30
		Chicle.....	10
	208	Gum Mastic.....	10
	209	" ".....	20
	210	" ".....	30
	211	" Sandarach.....	10
	212	" ".....	20
	213	" Galabanum.....	10
	214	" ".....	20
	215	" Kauri.....	10
32	216	" ".....	20
	217	" ".....	30
	218	Saugros Dragonius.....	10
	219	" ".....	20
	220	" ".....	30
	221	Gum Olibanum.....	10
	222	" ".....	20
	223	" ".....	30
	224	" Euphorium.....	10
	225	" ".....	20
	226	" ".....	30

227	Gum Elinne.....	10	33
228	" ".....	30	
229	" ".....	40	
230	" Anime.....	20	
231	" ".....	30	
232	" ".....	40	
233	" Guaiac.....	20	
234	" ".....	40	

NOTE—on margin of page containing Nos. 218 34
to 234 both inclusive: "many of these
gums did not mix"

WHITE WAX AS A BASE.

235	Resin	20	
236	"	30	
237	"	40	
238	Reg. No. 23.....	10	
	Spermaceti	10	
239	Reg. No. 23.....	20	35
	Spermaceti	20	
240	Reg. No. 23.....	30	
	Spermaceti	30	
241	Reg. No. 23.....	10	
242	" ".....	20	
243	" ".....	30	
244	" ".....	40	
245	" ".....	50	
246	Dammar.....	10	
247	"	20	36
248	"	30	
249	Bay Wax.....	10	
550	" ".....	20	
251	" ".....	40	
252	Gum Thus.....	10	
253	" ".....	20	
254	" ".....	30	
255	Asphaltum.....	10	
256	"	20	
257	"	30	

37

258	Soft Mexican Asphalt.....	10
259	" " ".....	20
260	Syrian Asphalt.....	10
261	" ".....	20
262	Pure Trinidad.....	10
263	" ".....	20
264	Bitumen.....	10
265	".....	20
266	Chalk.....	10

38

267	".....	20
268	".....	30
269	".....	40
270	".....	50
271	Gum Ammoniac.....	10
272	" ".....	20
273	" Aloes.....	10
274	" ".....	20
275	" ".....	30
276	Reg. No. 23.....	30

39

	Balsam Cafabia.....	10
277	Kaolin.....	20
278	".....	30
279	".....	40
280	".....	50
281	".....	75
282	".....	100

283	Reg. No. 23.....	30	} good, quite hard.
	Gutta percha in chloroform.....	10	

40

284	Reg. No. 23.....	30	} Very good.
	Rubber in benzol.....	10	

285	Gum Gedda.....	10
286	" ".....	20
287	" ".....	30
288	Reg. No. 23.....	10
	Japan Wax.....	20
289	Reg. No. 23.....	20
	Japan Wax.....	20
290	Reg. No. 23.....	30
	Japan Wax.....	30
291	Reg. No. 23.....	20
	Lamp Black.....	10

41

292	Reg. No. 23-----	20
	Zinc White-----	10
293	Alpha Naphthol-----	10
294	" "-----	20
295	" "-----	30
296	" "-----	40
297	" "-----	50
298	Beta Naphthol-----	10

NOTE.—On margin of page containing Nos. 288 to 298, both inclusive, "Fairly good, but there is danger of the naphthol distilling off slowly."

299	Beta Naphthol-----	20	} Not as good as No. 293-297.
300	" "-----	30	
301	" "-----	40	
302	" "-----	50	
303	Caustic Soda-----	10	} Acts on it and makes a hard ma- terial with bright lustre of cut, no scratch, soluble to a certain extent in water.

13

PURIFIED JAPAN WAX AS BASE.

310	Carnauba-----	5	} bang up, not very electric.
311	"-----	10	
312	"-----	20	
313	"-----	30	
314	"-----	40	} hard great con- traction.
315	"-----	50	
316	Asphalt (syrian)-----	20	} 44
317	" "-----	30	
318	" (Soft Mexican)-----	20	
319	" " "-----	30	
320	" Pure Trinidad-----	20	
321	" " "-----	30	

45

322	Alpha Naphthol	40	} Makes it very much softer and by mixing a cer- tain percent it makes a fluid oil.
323	Caustic Soda saponified it		
324	Stearic Acid	5	very good.
325	" "	10	better
326	" "	30	scratchy
327	Shellac	10	} Fairly good
328	"	20	
329	"	30	

CRUDE JAPAN WAX AS BASE.

345	Carnauba	10	
346	"	20	
347	"	30	} Non electric, good but inclined to be sticky so that dust would adhere.
348	"	40	
349	Myrtle Wax	20	
350	" "	30	
351	" "	40	
352	Alpha Naphthol		acts same as in No. 322
353	Shellac	10	
354	"	20	
355	Lomise	10	
356	"	20	
357	"	30	
358	Sugar	30	
359	Stearic Acid	10	
360	" "	20	good
361	" "	30	

COCOA BUTTER AS A BASE.

362	Carnauba	10	
363	"	20	
364	"	30	Fairly good
365	"	40	

366	Rosin	30	sticky	49
367	Stearic Acid	20		
368	" "	30		
369	" "	40		
370	Shellac	20		
371	"	30		
372	"	40		
373	Asphalt Syrian	10		
374	" "	30		
375	" "	60		50

STEARIC ACID AS BASE.

381	Carnauba	20		
382	"	30	} Very hard with great contraction	
383	"	40		
384	Cerasin	10		
385	"	20		
486	Alpha Naphtholol	30		
387	" "	20		51
388	" "	10		
389	" "	5		
390	Japan Wax Crude	5		
391	" " "	10		
392	" " "	20		
393	Shellac	3		
394	"	5		
395	Gum Dammar	5	} good	
396	" "	10		
397	Parafine	10	} Fairly good somewhat scratchy	52
398	"	20		
399	"	30		
400	Spermaceti	100		
401	Crude Bees Wax	100		
402	Glycerin	10		
403	"	20		
404	"	30		
405	Anilene Oil	10		
406	" "	20		
407	" "	30		

53

408	Oil Citronella	10
409	Oil Citronella	20
410	" "	30
411	" Cubebs	10
412	" "	20
413	" "	30
414	" Anise	10
415	" "	20
416	" "	30

54

417	" Organanum	10
418	" "	20
419	" "	30
420	" Croton	10
421	" "	20
422	" "	30
423	" Cassia	10
424	" "	20
425	" "	30
426	" Juniper wood	10

55

427	" " "	20
428	" " "	30
429	" " Berries	10
430	" " "	20
431	" " "	30
432	" Succinic	10
433	" "	20
434	" "	30
435	" Erigeron	10
436	" "	20

56

437	" "	30
438	" Tansy	10
439	" "	20
440	" "	30
441	" Fusel	10
442	" "	20
443	" "	30
444	" of Tar	10
445	" " "	20
446	" " "	30

57

447	Oil	Amber	-----	10
448	"	"	-----	20
449	"	"	-----	30
450	"	Linseed	-----	10
451	"	"	-----	20
452	"	"	-----	30
453	"	Analine	-----	10
454	"	"	-----	20
455	"	"	-----	30
456	"	Mace	-----	10
457	"	"	-----	20
458	"	"	-----	30
459	"	Orange	-----	10
460	"	"	-----	20
461	"	"	-----	30
462	"	Spruce	-----	10
463	"	"	-----	20
464	"	"	-----	30
465	"	Thyme	-----	10
466	"	"	-----	20
467	"	"	-----	30
468	"	Succus Coini	-----	10
469	"	"	-----	20
470	"	"	-----	30
471	"	Olive	-----	10
472	"	"	-----	20
473	"	"	-----	30
474	"	Cade	-----	10
475	"	"	-----	20
476	"	"	-----	30
477	"	Castor	-----	10
478	"	"	-----	20
479	"	"	-----	30
480	"	Cocoa Nut	-----	10
481	"	"	-----	20
482	"	"	-----	30
483	"	Pea Nut	-----	10
484	"	"	-----	20
485	"	"	-----	30

58

59

60

uite hard.

od

61

486	Oil Cotton Seed	10
487	" " "	20
488	" " "	30
490	Oleic Acid	10
491	" " "	20
492	" " "	30
494	Balsam Tolu	10
495	" " "	20
496	" " "	30
62 497	" Fir	10
498	" " "	20
499	" " "	30
500	" Canada	10
501	" " "	20
502	" " "	30
503	" Cafabia	10
504	" " "	20
505	" " "	30
506	Oil Wormwood	10
63 507	" " "	20
508	" " "	30
509	" Lard	10
510	" " "	20
511	" " "	30
512	" Petroleum	10
513	" " "	20
514	" " "	30

CARNAUBA AS A BASE.

64

520	Black Ozokerite	10
521	" " "	20
522	" " "	30
523	Syrian Asphalt	10
524	" " "	20
525	" " "	30
526	Wood Tar Pitch	10
527	" " "	20
528	" " "	30

good

529	Glycerine	10	65
530	"	20	
531	"	30	
532	Oleic Acid	10	
533	" "	20	
534	" "	30	
535	Vaseline	10	
536	"	20	
537	"	30	
538	Glacial Phosphoric Acid	10	66
539	" " "	20	
540	" " "	30	
541	Burgundy Pitch	10	
542	" "	20	
543	" "	20	
	Linseed Oil	10	
544	Chloride Zinc	10	
545	Stick Caustic Soda	10	
546	Coal Tar Pitch	10	
547	" " "	20	67
548	" " "	30	
549	Phosphoric Anhydride	10	
550	" "	20	
551	Sulphur	5	
552	"	10	
553	"	20	

NOTE—on margin of page opposite 550-552
and 553

"These were acted on when cooked at not
very high tem., the carnauba becoming
bleached quite white, but when heat was
carried very high, turned black and gave off
sulphurous fumes." 68

554	Balsam Cofabia	10	
555	" "	20	} good
556	" "	30	
557	" "	40	

69

558	Balsam Canada.....	10
559	" ".....	20
560	" ".....	30
561	" Perue.....	10
562	" ".....	20
563	" ".....	30
564	" Tolu.....	10
565	" ".....	20
566	" ".....	30
70 567	" Fir.....	10
568	" ".....	20
569	" ".....	30
570	" ".....	40
571	Oil Cocoa Nut.....	10
572	" " ".....	20
573	" " ".....	30
574	" Pea Nut.....	10
575	" " ".....	20
576	" " ".....	30
71 577	" Cotton Seed.....	10
578	" " ".....	20
579	" " ".....	30
580	" Olive.....	10
581	" ".....	20
582	" ".....	30
583	" Cade.....	10
584	" ".....	20
585	" ".....	30
586	" Castor.....	10
72 587	" ".....	10
588	" ".....	30
589	" Succus Coint.....	10
590	" " ".....	20
591	" " ".....	30
592	" Thyme.....	10
593	" ".....	20
594	" ".....	30
595	" Orange.....	10
596	" ".....	20
597	" ".....	30

598	Oil Spruce.....	10	73
599	" ".....	20	
600	" ".....	30	
601	" Amber.....	10	
602	" ".....	20	
603	" ".....	30	
604	" Linseed.....	10	
605	" ".....	20	
606	" ".....	30	
607	" Analine.....	10	74
608	" ".....	20	
609	" ".....	30	
610	" Mace.....	10	
611	" ".....	20	
612	" ".....	30	
613	" Fusel.....	10	
614	" ".....	20	
615	" ".....	30	
616	" Tansy.....	10	
617	" ".....	20	75
618	" ".....	30	
619	" Tar.....	10	
620	" ".....	20	
621	" ".....	30	
622	" Citronella.....	10	
623	" ".....	20	
624	" ".....	30	
625	" ".....	40	
626	" Cubebs.....	10	
627	" ".....	20	76
628	" ".....	30	
629	" Anise.....	10	
630	" ".....	20	
631	" ".....	30	
632	" Organonum.....	10	
633	" ".....	20	
634	" ".....	30	
635	" Croton.....	10	
636	" ".....	20	
637	" ".....	30	

77

638	Oil Juniper Wood	10
639	" " "	20
640	" " "	30
641	" " Berries	10
642	" " "	20
643	" " "	30
644	" Sassafras	10
645	" " "	20
646	" " "	30

78

647	" Succinic	10
648	Oil Succinic	20
649	" " "	30
650	" Eriginon	10
651	" " "	20
652	" " "	30
653	" Cassia	10
654	" " "	20
655	" " "	30

656 Colodion, did not mix

79

657	Metalic Sodium	$\frac{1}{2}$
658	" " "	2
659	" " "	3 (very good)
660	Cerasin	20 { non-electric
	Metalic Sodium	3 { very good
661	Oil Petroleum	20
662	" " "	30
663	" Worm Wood	20
664	" " "	30
665		

80 664 $\frac{1}{2}$ " Lard 30

MISCELLANEOUS MIXTURES.

665	Gum Thus	100
	Alpha Naptholol	30
666	Gum Thus	100
	Alpha Naptholol	20
667	Gum Thus	100
	Alpha Naptholol	10

81

668	Gum Thus.....	100
	Alpha Naphtholol	5
669	Rosin	100
	Alpha Naphtholol	30
670	Rosin	100
	Alpha Naphtholol	20
671	Rosin	100
	Alpha Naphtholol	10
672	Rosin	100
	Alpha Naphtholol	5
673	Linseed Oil.....	100
	Alpha Naphtholol	30
674	Oil Carni	100
	Alpha Naphtholol	30
675	Glycerine.....	100
	Alpha Naphtholol	20
676	Glycerine.....	100
	Alpha Naphtholol	10
677	Glycerine.....	100
	Alpha Naphtholol	5
678	Paraffine	100
	Carnauba.....	100
	Cerasin	100
	Bees Wax	100
	White Bees Wax	100
	Peuco Japonico	100
	Crude " Wax.....	100
	Spermaceti.....	100
	Stearic Acid.....	100
	Myrtle Wax.....	100

82

83

84

NOTE.—Opposite 678 "very good only it is a little too soft and will gum up under needle."

679	Syrian Asphalt.....	100
	Sodium (metallic).....	$\frac{1}{2}$
680	Syrian Asphalt	100
	Sodium (metallic).....	2
681	Carnauba to which has been added a small per cent. of metallic sodium.	100

85

Syrian Asphalt.....100

Cerasin Residue by ether
(No. 697) 120

Result was "bang up" non electric.

686 Carnauba is partly saponified by alcoholic potash, the product is boiled in water to dissolve out the saponified portion, the residue is mixed with cerasin; result is good but not sufficient to warrant its use instead of ordinary carnauba in reg. No. 23 on account of the expense of the operation."

86

687 Carnauba is melted under vacuum and solidified; bubbles of air come out of it but its crystalline properties were unaltered.

688: Tried preparing surface of a regular No. 23 cylinder with alcohol, it seemed to entirely take away the electric properties, and it did not scratch.

—ON CRYSTALIZATION— (to prevent)

87

689: Tried cooling melted Reg. No. 1 while in intense vibration, produced by means of an electric tuning fork, large size, also tried stearic acid, spermaceti, alpha naphthol, and reg. No. 23, the result was not very promising, it only seemed to make the crystals formed, a little finer size.

690: Tried revolving melted carnauba in a bottle fastened to the end of a string, until it became solidified, apparently no change in crystalization.

88

691: Tried cooling paraffine (melted) over the pole of a powerful magnet. Made a very peculiar effect, the paraffine when cold had a large lump made directly over the magnet pole.

The paraffine was melted in a small tin pan, and the lump was as represented in Fig. 1.

(Sketch.)

89

692: Tried cooling a pan of melted paraffine over two poles (+&-) of a powerful magnet, there was a depression formed over one pole and an elevation over the other though indistinct. From above experiment would conclude that particles of paraffine during crystallization or solidification, are repelled by one pole and attracted by the other pole of a magnet. To be followed up when have more time.

693: Tried mixture of paraffin and Alpha Naphthol which crystallized well, cooled from a melted state over poles of a powerful magnet. The crystals were influenced considerably by the magnetism from two or three grms over the poles of the magnet they radiated out in different directions and the lines formed curved in various ways. 90

694: Tried cooling reg. No. 23 in vessel surrounded by a helix as shown in Fig. 2 with the idea of making the crystals lay parallel with the circumference so that the needle would cut in the direction of their length instead of across them at right angles. Fig. 3 shows the kind of crystallization wanted. Fig. 4 the natural Crystallization. 91

(Sketches)

This was not thoroughly followed up.

695: Tried extracting carnauba with alcohol to dissolve out the crystalline portion. A part was separated but result was not satisfactory. 92

696: Tried extracting carnauba with ether, result differed somewhat from 695, but they were not what was wanted.

697: Tried extracting cerasin by ether, result was "bang up" The residue not dissolved consisted of about half of the total amount of cerasin, and was hard, translucent, with fine lustre on cut surface, when cooled on glass it made a very shining surface, when

93

the wax lay in contact with the glass—made a good phonograph wax, would also be splendid for electrotyping.

MISCELLANEOUS EXPERIMENTS.

698: Paraffine treated as in No. 697, made a hard paraffine, but had more scratch than No. 697

94

699: White wax treated as in No. 697. Residue obtained was very good only the expense of white wax is too great to make it of use

700 Potatoes were sliced and reduced to pulp and extracted by ether to obtain potatoe wax mentioned in Watts Chem. Dictionary, but did not obtain the wax only obtained a sugary dark substance; followed the directions given in Watts exactly.

95

701: Distilled Carnauba, obtained no solid substance suitable for wax cylinders but some were solid and might be that if the more liquid portions were separated it would be good. Try.

DISTILLATION.

702: Distilled bees wax and saved distillates taken at different times. Ackrolin was given off.

703: Distilled Japan Wax, obtained no suitable wax material but obtained a colourous liquid strong enough to knock a horse down, was probably quite pure ackrolin; distillates were saved.

96

704: Distilled myrtle wax, obtained no hard substance suitable for wax cylinders, but obtained a fluid similar to one mentioned in 703 which was even stronger than that one; distillates were saved

705: Distilled paraffine

706: " Cerasin

707: " Spermaceta

 LINSEED ASPHALT.—MARCH 20TH, 1888.

708: Linseed oil boiled down in a pan or vessel partly covered, is ultimately converted into a black, tough, non sticky, somewhat elastic, asphalt which mixes with many of the waxes, dissolves in turpentine, benzole, chloroform and other solvents. When mixed with waxes it has the tendency to toughen them, but when too much is added they become draggy. This material would make an excellent elastic varnish for carriages, etc. 98

In making care must be taken not to cook it too long or it will oxydize and make quite a different substance, samples should be taken from time to time. It is better to apply strong heat and boil down quickly. About two thirds of the oil is converted into the asphalt.

APRIL 18th, 1888.

709: Glycerine boiled down at rather high temperature leaves an asphalt black, tough, and sticky but disintegrated by water. 99

This material mixes with some of the waxes but so far has proved of no value for use in phonograph wax.

710: Cotton seed oil boils down under similar conditions to those in making linseed asphalt, to an asphaltic material very like the latter.

711: Lard oil can be boiled down to an asphalt similar to that of linseed oil.

715: On cotunite (Native Chloride of Lead) described in Watts as a horn like substance— with a view to its use as a phonograph recording medium, an insulator and other uses, provided it has the qualities expected. 100

Fused in crucibles, Lead Chloride	4	gm
Copper "	1	"
Sodium "	1	"
Copper Sulphate.....	1	"

101

The result was a hard crystalline, brownish mass.

716: Fused in crucibles, Lead Chloride.....3 grm
 Sodium " 3 "
 Copper Sulphate..... $\frac{1}{2}$ "
 " Chloride..... $\frac{1}{2}$ "

The result was a hefar colored mass very hard and crystalline.

717: Fused in crucibles, Lead 10 grm
 Copper 2 "
 Sulphur 2 "
 Sodium Chloride.... 5 "

102

The result was a hard crystalline metal and a white crystalline, hard substance.

ON HORN LEAD.

718: Fused in crucible, Lead Sulphate.....4 grms
 Sodium Chloride.....4 "
 Copper Sulphate.....3 "
 Result *

103

719: " " " Lead Sulphate.....4 grms
 Sodium Chloride.....6 grm
 Copper Sulphate .. 1 "
 Sulphur..... $\frac{1}{2}$ "

720: " " " Lead Chloride.....5 "
 Sodium " 4 "

721: " " " Lead.....10 grm
 Copper Sulphate.....5 "
 Lead Chloride.....3 "
 Sodium " 4 "

104

Note: on bottom of page containing Nos. 718 to 721 both inclusive: * "See first Page II."

722: Fused in crucible, Lead.....10 grm
 Lead Chloride..... 4 "
 Sodium " 4 "
 Copper Sulphate..... 2 "
 723: " " " Lead.....4 grm
 Copper 2 "
 Sulphur..... 2 "
 Sodium Chloride.....5 "

				105
724:	Fused in crucible,	Lead Chloride.....	5 gm	
		Sodium.....	2 "	
		Copper.....	2 "	
		Sulphur.....	3 "	
725:	" " "	Lead, Copper sulphate and sodium with chlorine passed through while in molten state.		
726:	" " "	Lead.....	3 gm	
		Copper.....	2 "	
		Sulphur.....	2 "	106
		Sodium Chloride.....	5 gm	
727:	" " "	Lead Chloride.....	6 grms	
		Copper ".....	4 "	
		Copper Sulphate.....	2 "	
		Chloride Sodium.....	2 "	
728:	" " "	Lead Chloride.....	6 gm	
		Copper Chloride.....	2 "	
		Lead sulphate.....	3 "	
		Sodium Chloride.....	3 "	
729:	" " "	Lead Chloride.....	8 gm	107
		Sodium ".....	5 "	
		Copper Sulphate.....	3 "	
		Cooled slowly.		
730:	" " "	Lead Chloride.....	6 gm	
		Copper ".....	1 "	
		Sodium ".....	2 "	
		Lead Sulphate.....	2 "	
		Cooled slowly.		
731:	Fused in crucible,	Lead Chloride.....	6 gm.	
		Sodium ".....	2 "	108
		Lead Sulphate.....	2 "	
		Copper.....	1 "	
		Poured in cold water.		
732:	Fused in crucible,	Lead Sulphate.....	6 gm.	
		Sodium ".....	4 "	
		Copper Chloride.....	2 "	

109

733 : Fused in crucible, Lead Chloride..... 6 grm.
 Copper " 6 "
 Sodium " $\frac{1}{2}$ "
 Copper Sulphate..... 2 "

734 : In crucible Chloride Lead..... 3 grm.
 " Tin..... 1 "
 " Sulphur. 1 "

110 735: In combustion tube with air exhausted, freshly made chloride lead is fused. This when cooling is left in the tube with air still exhausted until it became solid enough to be safe from oxidation. Result was a very horn-like substance in appearance, but it was brittle and harder than horn and consequently not adapted for the uses anticipated for it.

737 : A solution of Syrian Asphalt 100, Carnauba 100, cerasin is dissolved in benzol to a thick paint and this coated on a shell of paper. The idea being to

111 make something that will not require turning off to be used once and thrown away. Made an excellent film with good cut and so on, did not try on phonograph.

May 27, 1888

METALLIC SALTS OF FATTY ACIDS

112 739: Oleic Acid is saponified by $\frac{1}{6}$ of its weight of Lewis' Lye and the resulting soap dissolved in hot water and precipitated by excess of a solution of acetate of lead, the precipitate washed, dried and fused. Result was a very amorphous, plastic, translucent, brownish, waxy mass, which very much resembled crude Japan Wax. When mixed with Carnauba in proportion of 100 of the oleate to 30 carnuba, it formed a very good phono wax, non electric and with very little scratch, very heavy shaving. Very encouraging as it gives an opening to a new and promising field.

113

METALLIC SOAPS.

740: Oleic Acid saponified by $\frac{1}{2}$ its weight of Lewis Lye and precipitated by acetate of lead in excess. Made a harder oleate than No. 739.

741: Oleic acid saponified by $\frac{1}{2}$ its weight of Lewis Lye and precipitated as in No. 739 gives a harder and heavier oleate than No. 740, from this it would seem that it could be made of any constancy by altering the amount of soda which is true up to a certain limit when the melting point becomes so high that it reduces before fusing.

114

METALLIC OLEATES.

742: Oleate Magnesia made similar No. 739 and precipitated by excess of sulphate of magnesia, made transparent, light plastic mass. Mixes with waxes though with greater difficulty than No. 739.

115

743: Cerasin 50 gm.
Carnauba 30 "
Oleate Lead 50 "

"Bang up!"

744: Cerasin 50 gm.
Carnauba 30 "
Oleate Magnesia 50 "

Good, even less scratch than No. 743.

744½ Copper, Lead, Oleate. Precipitated from soap solution by mixture of acetate of copper & lead.

116

745: Duplicated No. 739, making 6 lbs. Of this lot gave Payne 3 lb. to experiment with for the mailing cylinder, and other experiments. Was an exact duplicate of No. 739.

746: Soap of oleic acid is precipitated by a mixture of acetate of lead and sulphate of magnesia, with the idea of making an alloy oleate. Result was similar to the lead oleate but lighter colored and more transparent.

117

OLEATES (METALLIC) SAVED FOR FUTURE EXPERIMENTS.

747: Oleate copper precipitated from soda oleate by acetate of copper. Result was a green, waxy, shiny mass, harder than lead oleate, less cohesive than lead oleate, very electrical.

It mixes with carnauba and makes a hard wax with great lustre on cut surface, elegant for the phonograph except that it is very electrical.

118

748: Copper acetate mixed with glycerine and heated to high temperature, precipitates metallic copper in a finely divided state.

749: Oleate Chromium precipitated from the soda soaps as a violet precipitate, from a solution of chloride of chromium.

OLEATES.

119 750: Precipitated Zinc from boiling solution of oleate of sodium, by sulphate of zinc.

751: Mercury Oleate precipitated from oleate of soda by chloride mercury.

752: Tin Oleate precipitated from soda oleate by chloride Tin.

753: Alumina Oleate, precipitated from solution of oleate soda by chloride of alumina. Soft, transparent, elastic, lustrous.

754: Oleate Barium, precipitated from oleate soda by chloride barium.

120 755: Oleate Calcium, precipitated from oleate soda by chloride calcium.

756: Oleate Strontium precipitated from oleate soda by chloride strontia.

757: Oleate manganese, precipitated from oleate soda by sulphate manganese.

758: Oleate of Cobalt, precipitated from oleate soda by nitrate cobalt.

759: Oleate silver & lead, acetate of lead solution mixed with nitrate silver solution forms a white precipitate from oleate soda solution.

121

760: Residue of Oleic acid which probably contains stearic & palmitic, is heated in evaporating dish and a concentrated solution of acetate lead added. The lead combined precipitating free acetic acid. This is important as lead and other oleates and fatty acid salts might be made much cheaper in this way than in the ordinary.

761: Oleate Antimony precipitated from soda soap solution by butter of antimony.

762: Oleate Silver precipitated from soda soap by 122
nitrate of silver, not stable.

764: Oleate iron precipitated from soda soap by nitrate of iron.

765: Oleate nickel precipitated from soda soap by either sulphate or acetate.

766: Oleate Uranium, precipitated from soda by uranic acetate.

767: Oleate Bismuth precipitated from soda soap by acetate bismuth.

768: Magnesium residual oleate. Crude oleic acid is 123
cooled to low degree and strained, the residue saponified by caustic soda solution, 130 grm (of sp gv. 1.2648) to 200 grms of oil. This is dissolved and precipitated by 165 grms magnesium sulphate dissolved in water, washed and placed in steam oven to dry.

When dry it melts down slowly while yet in the steam oven to a *transparent*, flexible, harder than lead oleate, insoluble in water compound having great lustre. This might be good for a varnish, for photograph plates and for mailing cylinders.

124

PALMITATES.

769: Palmitates of lead, made same as the oleate except Merks palmitic acid is used instead of oleic acid, hard and very good.

770: Palmitate Copper, hard but electrical, made same as oleate copper.

771: Palmitate magnesium, made same as oleate, hard transparent.

125

772 : Palmitate manganese, hard, reddish or pinkish hue, very good on phonograph.

773 : Palmitate iron, made same as the oleate, brown, hard.

774 : Palmitate alumina, made same as the oleate, hard with a kind of gelatine constancy, high melting point.

775 : Palmitate zinc, made same as the oleate.

126 776 : Palmitate manganese softened with a little cerasin or lead oleate makes apparently just the cheese for phono wax.

777 : Palmitate lead softened with cerasin is very good in appearance and cut.

778 : Japan Wax saponified and precipitated by acetate lead ; no good, the Japan wax did not completely saponify, and made muddy solution.

MISCELLANEOUS METALLIC SOAPS.

127

779 : Molasses.....100 Boiled for some
Calcined Soda..... 28 time, dissolved
Oleic Acid.....100 in water and
precipitated by acetate lead. Very tough,
dark brown to black waxy mass.

780 : Red oil.....100 Dissolved and
Caustic Soda..... 25 precipitated by
half and half magnesium sulphate and
lead acetate.

128

781 : Palm Oil 100 } Precipitated by
Oleic Acid 100 } Magnesium
Soda Soap of } sulphate.

782 : Palm oil, oleic acid and linseed oil saponified and precipitated by sulphate magnesium.

783 : Saponified Oleic Acid with rosin by Lewis Lye and precipitated by acetate lead.

784 : Resinates all are infusible without decomposition.

Resinate lead made in the same way as the oleate.

785 : Resinate copper same way as the oleate.

129

786: Resinate iron same way as oleate iron (brownish infusible, without decomposition.

787: Resinate magnesia made same as oleate mg.

788: Resinate alumina made same as the oleate.

789: Resinate manganese made same as the oleate.

MISCELLANEOUS METALLIC SALTS.

790: Resinate mercury, made like the oleate.

791: Resinate zinc, made same as the oleate.

130

792: Resinate Tin, made same as the oleate.

793: Resinate Barium, made same as the oleate.

794: Stearate of lead made same as the oleate, *very* hard in fact too hard, powdery to cut, would make a good hardener.

795: Stearate alumina, made same as the oleate.

796: Stearate manganese, very hard, higher melting than lead stearate.

797: Stearate copper, hard green.

798: Stearate iron, hard redish brown.

131

799: Stearic Oleate lead, made from the soap of equal parts stearic and oleic acid, precipitated by lead acetate—perfection.

Several pounds were made also some cylinders, absolutely perfect.

800: Magnesium Stear Oleate, made in like manner to the lead soap of 799, infusible.

NOTE: July 25th, 1888—on page opposite page containing Nos. 801 and 802:

Moved up to Room 14 with Payne, and the following experiments were made jointly with him. 132

JULY 25TH, 1888

METALLIC FATTY ACID SALTS.

801: Oleic Acid (Crude) filtered 6 lbs or 2732 grms Lewis Lye (standard solution of Sp. gv. 1270=1300 cc

Saponified hot and dissolved soap in hot water, precipitated by 9550 cc. Standard solution of acetate of lead, washed in water, spread on evap-

133

orating pan, and dried in hot air, after washing it formed a sticky cream colored mass, but when dried it changed to a light yellow.

JULY 27TH, 1888

802 : Stearic Acid 2732 grm.
Standard lye solution..... 1300 cc

1:4

Saponified by aid of heat to a fine white soft soap, dissolved in hot water—strained twice through cloth and precipitated by 9000 cc, standard solution acetate lead, to a fine white granular mass, not coheasive ; washed in H_2O and dried in oven.

JULY 27TH, 1888

803 : Stearic Acid 455 grm
Oleic Acid 455 "

135

Standard solution lye—433 cc (see opposite)
Saponified hot to a cream colored soap, dissolved in hot H_2O to a clear solution, and precipitated by acetate lead solution. Precipitate rather adhesive, granular white mass, washed thoroughly in cold water, dried in hot air bath, obtained minus loss by adhesion to vessels etc. 1150 grm. when melted down.

JULY 28TH, 1888

804 : Lard 100 Grm.
Lewis Lye 17 "

136

Precipitated by $C_4H_6Pb11_{04} + aq.$

Granular white sticky mass of consistency of lead oleate. Dried in hot air bath to pliable brown cohesive mass.

NOTE : on page opposite that containing Nos. 803 and 804 :

" Standard Solution Lye."

Lewis Lye, dry Powdered.

" Dissolve 1 lb, equivalent of 6 lb oleic or stearic

137

acid according to old saponifications in sufficient quantity H_2O Filtered and found sp. gv. at 90 deg. F to be 1,270 deg, total amount of solution—1300 cc, which was taken as the quantity required to produce the old degree of saponification of 6 lbs of oleic or stearic acid.

"Standard solution Pb acetate Neutral acetate lead, in H_2O , sp. gv. 1.150 at 86 F."

JULY 28, 1888 138

METALLIC SOAPS

805: Crude Oleic Acid 600 grm.
 Stand. Solution Lye..... 570 cc
 Precipitated lye solution Ng. S.O.₄ to granular mass resembling stearate lead, dried in hot air bath to straw colored transparent mass.

JULY 30, 1888 139

806: Stearic Acid 600 grm.
 Oleic Acid (crude)..... 600 "
 Saponified by 285 cc of
 standard solution lye and precipitated by aluminum chloride

JULY 30TH, 1888

807: Peanut Oil 600 grms
 Standard solution Lye..... 285 cc 140
 very hard to saponify, precipitate by acetate of lead to a very white cohesive mass resembling oleate of lead in constancy, but the heat required to drive out the moisture reduced lead and turned the mass blackish

JULY 30TH, 1888

808: Stearic Acid 300 grm
 Oleic Acid..... 300 "
 Standard Solution Lye..... 285 cc
 Precipitated by cupin acetate.

141

Aug. 1, /88

809 : For hardening No. 803

Stearic Acid	100=500 grm
Oleic Acid	75 " 375 "
Saponified by stand. solution	
lye	416 cc
doubled all amounts.	

Aug. 3/88

142

810 : Stearic Acid	100=366 grm
Palmitic "	66- $\frac{2}{3}$ =200 grm
Stand. solution lye	235 cc

Saponified readily to a clear soap solution when dissolved in H_2O . Precipitated by acetate lead, gave very white dry granular precipitate, melts at 210 deg. F. When melted came down to a darkish clear liquid. On cylinder very hard, dry, semi transparent but seemed to scratch about the same as regular on phonograph "*Bang Up*" Hard-Powder chip, indentations not deep, fine talk, "nothing better wanted."

143

(Note opposite Exp. No. 811) "First lot did not turn out like test tube sample, but was rather soft, sticky and dark, with very poor surface, though good fracture after being cast in mold and allowed to stand some time, became mottled and absolutely no good—unlike the other compounds it expands on cooling."

Aug. 5, /88.

144

811 : Rimi Elaidiate of Lead

" Elaidic Acid	100=300 cc
Saponified by standard solution lye..	142.5 cc

Saponified readily to a yellow liquid which on cooling became quite hard, dissolved very readily in warm H_2O Precipitated by warm $C_4H_4PbO_4$ to a finely divided yellowish mass which on drying became a yellowish white powder. When melted it became semi-transparent yellowish mass—very hard and having good cut and surface.

145

Aug. 8th, /88.

812: Eliadiate of Lead

Elaidic	455 Grm.
Stand. Sol. of lye	216 "

Saponified to a thin, soft muddy brown soap, very soluble in hot H_2O

Precipitated by $C_4H_6PbO_4$

813: Stear Oleate of Lead

146

Stearic Acid	100=300 gm
Oleic "	66.6=200 "
Stand Sol. Lye	235 cc.

814: Stero Palmitate of Lead

Stearic Acid	100=300 gm
Palm Oil (crude)	66.6=200 "
Stand. Sol. Lye	235 cc

Saponified readily to a soft yellow mass, easily soluble in hot water. Precipitated by Pb acetate to a finely divided yellowish mass which on being dried and melted became hard though not very strong.

(Note—on page opposite experiment No. 814.)
 "Cylinder made of No. 814 was N. G.—had fine surface hard and polished for about a sixteenth of an inch deep but deeper it was rotten, giving no polish and having no adhesion."

Aug. 9th, 1888.

815: Stero Palmitate of Lead

148

Stearic Acid	300 gm.
Palm Oil (strained)	200 "
Stand. Sol. Lye	235 cc

Saponified readily to a soft yellowish soap, easily soluble in hot water, precipitated by $C_4H_6Pb^{11}O_4$ to finely divided yellowish mass, when dried and melted became hard on surface and rotten inside, very similar to No. 814.

149

Aug. 14, /88.

816 : Stearic Acid 200 grm.
 Oleic Acid treated with
 PbO₂ & H₂O (see opposite) 133.3 grm.

Saponified with stan. Sol. Lye 156 $\frac{2}{3}$ cc to a transparent soap easily sol. in hot water. Precipitated by lead acetate, precipitate white granular, rather adhesive.

150

(Note : opposite experiment No. 817.) "Crude Palm Oil treated in flask to 464 deg. F. for $\frac{1}{2}$ hour then filtered. Color changed from bright yellow to dark wine color, resembling color of oleic acid. The process was carried on too long or heat raised too high—otherwise the color would have been destroyed rather than changed."

817 : Stearic Acid 100
 Palm Oil (see opposite) 66.6 grm.

151

Saponified by stand. sol. Lye. 128 cc to a hard white soap, soluble in hot water but not easily.

Aug. 15, /88.

818 : Stearic Acid 200 grm.
 Palm Oil—decolorized by boiling to a
 light lemon color 133.3
 Stan. Sol. Lye 156 $\frac{2}{3}$ cc

152

Formed a soap slightly tinged with yellow. Precipitated by C₄ H₆ Pb¹¹ O₄ to a white soap when melted down very much resembled No. 10 in appearance, but was rotten when melted down and cooled.

(NOTE : Opposite experiment No. 819) "Cocoanut oil saponified by strong lye, dissolves in H₂ O & the fatty acid precipitated by addition of H Cl, washed and water evaporated, resulting oil resembled Merks Palmitic acid in taste, smell and under cold but was slightly lighter than Merks in color "

819 : Stearic Acid 25 grm.
 Cocoanut Oil (see opposite) 16.6
 Stan. Sol. Lye 32 cc

153

Saponified by aid of heat to a light, hard soap, dissolved in hot water to a white solution. Precipitated by acetate lead to a fine, white granular mass. Melted down to a semi-transparent brown mass exhibiting to proprieties of No. 810 only hard & more powdery to cut.

820 : Stearic Acid.....	100 grms
Cocoanut Oil.....	66.6 "
Standard Solution Lye.....	128 cc

154

Soap white, hard white hot transparent. The oil was hot but saponification did not take place fully until some of the water had been evaporated then it turned hard quickly; soap dissolved to a perfectly clear solution. Precipitated by acetate lead to a white granular mass, which melted down to a semi-transparent clear light brown mass closely resembling No. 810, only harder therefore more powdery to cut.

AUG. 20, 1888

155

821 : Stearic Acid.....	200 grm.
Cocoanut Oil.....	200 "
Stand. Solution Lye.....	188 cc

Soap white, saponification same as No. 820, dissolved to a clear solution. Precipitated by acetate lead to white granular mass. Melted down to a clear & very transparent liquid but when cold it has not very good cut.

156

822 : Stearic acid.....	100 grm.
Cocoa Nut Oil.....	100 "
Stand. Sol. Lye.....	154 cc

Did not all saponify at once but by heating until some of the H_2O had evaporated it became a hard soap very white, gave a perfectly clear solution in hot H_2O . Precipitated by acetate lead to finely divided white mass.

157

823 : Stearic Acid.....	200	gram.
Cocoanut Oil.....	133.3	"
Oleic Acid.....	50	"
Stand. Solution.....	200	cc

Aug. 21, /88

824 : Stearic Acid.....	100	gram.
Cocoa Nut Oil (Treated—see opposite)	66.6	"
Stand. Sol. Lye.....	78.3	cc

158

Saponified readily hot, to a fairly hard soap, dissolved to a slightly milky solution in hot H_2O . Precipitated by acetate lead, precipitate granular and not very adhesive. Melted down to a clear mass, when cold became light greyish brown. In cut, fracture, color, polish, resembled No. 810 more nearly than any previous. It is perhaps a trifle more powdery to the cut.

159

NOTE: On page opposite Exp. No. 824: "Cocoa Nut Oil saponified completely while hot with strong lye Sp. G. 1.300, then precipitated by HCl , washed and water evaporated. The resulting acid closely resembles Merks Palmitic acid in odor, taste, color and density."

Aug. 21, /88.

825 : Stearic Acid.....	100	grms.
Cocoa Nut Oil (see 24).....	80	
Stand. Solution Lye.....	84.6	cc

160

Saponified hot with a little more difficulty than No. 24.

826 : Stearic Acid.....	75	gram.
Cocoa Nut Oil.....	75	"
Oleic Acid.....	75	"
Stand. Solution Lye.....	105.75	cc

Saponified when very hot to transparent amber colored soap—gave clear solution in H_2O . Precipitated

161

by acetate lead to white adhesive mass, melted down to a light colored quite transparent mass, was very clear when hot. Too soft, much too soft, but otherwise good—pliable somewhat.

827 : Cocoa nut Oil..... 50 grms.
Oleic Acid..... 25 "

75

Stearic Acid..... 100 grm. 162
Cocoa nut Oil & Oleic (as above)..... 66.6 grm.
Stand. Solution Lye..... 78.20 cc

Saponified when very hot to transparent colored soap. Rather cloudy solution in H_2O . Precipitated by acetate lead to a white very finely divided mass.

8/22/88

828 : Cocoanut Oil sample (No. 1) Treated as in
No. 824..... 100 grm. 163
Stand. Solution Lye..... 48 cc

Saponified readily to white and when hot amber colored soap. Precipitated by acetate lead to slightly adhesive granular white mass. When melted was transparent perhaps slightly more so than No. 810 which it resembles but was too hard and powdery.

829 : (No. 2) Cocoa oil—saponified & fatty acids precipitated by H Cl) 164
Of these acid..... 200 grm.
Stan. Sol. Lye..... 100 cc

Saponified to a rather soft translucent amber colored soap. Clear solution in H_2O . Precipitated by acetate lead to very white somewhat adhesive granular mass.

830 : Fatty acids (see opposite)..... 200 grm.
Stan. Sol. Lye..... 100 cc

165

Saponified readily to white semi transparent soap, clear solution in hot water. Precipitated by acetate lead to white granular hard mass of peculiar behavior, grains about size of No. 6 shot—hard and not adhesive, melted down, when transparent, when cold, semi-transparent. Printing could be read through piece $\frac{1}{16}$ " in thickness.

(Note: on page opposite Exp. No. 830) "Oil sample No. 12 Fatty acids obtained by saponification and precipitation of a mixture of

166

No. 2 cocoa N Oil 100
Oleic Acid..... 15

BLEACHING EXPERIMENTS.

OIL SAMPLES.

No. 1 O. S.

167

Sample of $C_{16} H_{32} O_2$ obtained from Lehen & Fink at .40 per lb from it was made No. 10 which Mr. Edison found so good at one time. In reality it is not palmitic acid but a mixture of palmitic, oleic and small amounts of capric, caprolic and other volatile acids.

No. 2 O. S.

168

$C_{18} H_{34} O_2 + (Pb O_4 + H_2 O_2)$ not heated but allowed to stand for several hours to settle. Found oil on top which when filtered was in color and general appearance between $C_{18} H_{34} O_2$ and $C_{16} H_{32} O_2$. When cooled down to 60 deg. F. and allowed to stand for six hours a dirty white precipitate settled out leaving the oil a clear slightly lemon color slightly resembling $C_{16} H_{32} O_2$.

169

No. 3 O. S.

$C_{18}H_{34}O_2$ = 100 by wt.
 PbO_4 = 50 " "
 H_2O_2 = 50 " "

Heated $C_{18}H_{34}O_2$ to 212 deg. F. then add PbO_4 after H_2O_2 and left to stand after well stirring, stood 10 hours then decanted and filtered.

No. 4 O. S.

170

Palm oil heated to 100 deg. F. then treated with mixture of $H_2Cr_2O_4$, HCl and H_2SO_{41} a bleaching mixture recommended by Watt, allowed to settle, decanted, water evaporated and filtered hot.

No. 5 O. S.

Palm oil treated at same time with Hypo Chloride lime and hydro chloric acid. The resulting oil is again treated in same manner.

171

No. 6 O. S.

Same as No. 5 only process not carried so far, or rather No. 5 before retreatment.

No. 7 O. S.

Palm oil treated with hypo chloride of lime that is boiled together, oil separated, decanted, washed H_2O , evaporated and filtered.

172

No. 8 O. S.

Cocoa N. Oil saponified with Stan. Sol. Lye at 85 deg. F. Only about $\frac{1}{3}$ of the oil formed a soap, this part dissolved in H_2O and precipitated by HCl , washed and filtered.

No. 9 O. S.

The part of No. 8 not saponified.

To be continued in book No. 565.

173

**"Defendant's Exhibit, Aylsworth Note-
Book No. 565."**

OIL SAMPLES (bleeching)
continued from book 564.

No. 10. O. S.

174 Fatty acids precipitated from Ceylon cocoanut Oil by saponification and H.Cl.

No. 11. O. S.

Fatty acids obtained from poorer grade of c. n. oil by saponification and precipitation by H.Cl.

No. 12. O. S.

Fatty acids in similar manner to above from No.

175	2 cocoa N. Oil	100
	Oleic acid	15

No. 13. O. S.

Ceylon cocoa nut oil at present worth in large lots about 6½c. per lb.

No. 14. O. S.

Poorer grade No. 2 of cocoa nut Oil at present worth in large lots, about 5¼c. per lb.

176

No. 15. O. S.

Oleic acid treated with hypo chloride lime, not enough being used to convert more than ½ into oleate of lime, other part not converted, filtered.

Continuation of Metallic Soaps from Book 564.

8/23/88

831	Cocoa nut oil	200	gram.
	Oleic acid	30	"
	Stan Sol Lye	138	c c

177

Note-

Saponified by heating to white semi transparent mass. Clear solution in hot H_2O . Precip'd by acetate lead, to white granular hard mass like that of No. 30. Melted down was like No. 30, except slightly more transparent & had slightly better cut.

832 Cocoa nut oil No. 2 300 gram.
Stan Sol Lye 180 c c

Fatty acids precipitated from aqueous solution of soap. Amt. of fatty acids obtained—265 grms., a loss of $11\frac{6}{10}\%$ in glycerine and volatile fatty acids. 178

(Note on page opposite Expers. Nos. 833 & 834)
Bang up :

No. Metallic Soaps.

833 Cocoa nut oil No. 2 200 grm.
Oleic acid 20 "
Stan Sol Lye 132 c c 179

Saponified to white soap in action and appearance was like No. 30 & No. 31. Precipitated by acetate lead to white mass like that of No. 30 & No. 31.

8/23/88

834 Cocoa nut oil 200 grm
Oleic acid 40 "
Stan Sol Lye 144 c c

Did not entirely saponify soap amber colored, rather cloudy solution in H_2O . Oil that floated on solution skimmed off. Precipitated by acetate lead white gran. slightly adhesive, melted to clear liquid & cooled to very transparent mass, cut fine, fracture fine—appears best so far. 180

No. Metallic Soaps. 8/23/88.

835 Portion of soap solution of No. 833 precipitated by mixture of about equal parts magnesium & lead acetate. Formed white adhesive mass. Melted

181

down to clear liquid & cooled transparent—more so than No. 831, cut good—worth experimenting on.

8/23/88.

836 Portion of soap solution of No. 834 precipitated by mixture of lead acetate & magnesium acetate. 1 of lead to 2 of mg.

Formed white adhesive mass—melted down to clear liquid—cooled to dark amber mass, more transparent than No. 835.

No. Metallic Soaps.

8/24/88.

837 Cocoa nut oil No. 2 200 gm.
Oleic acid 40 "
Stan Sol Lye 168 c c
Same as No. 34 except increase of lye.

8/24/88.

838 Cocoa nut oil No. 2 200 gm.
Oleic acid 50 "
183 Stan Sol Lye 150 c c

Saponified difficulty, but by prolonged heating turned into rather dirty hard, white soap which gave fairly clear solution in hot H_2O . Precip'd by acetate lead to white hard granular mass, grains size of shot, very nice to work, when melted clear, when cold whitish $\frac{1}{2}$ transparent—cut good, slightly tougher & more adhesive than less oleic.

184 No. Metallic Soaps.

8/24/88.

839 Fatty acids from No. 2 Co. N. oil 100 gm.
Oleic acid 25 "
Stan Sol Lye 81.5 c c

840 Cocoa nut Oil No. 2 1000 gm.
Oleic acid 200 "
Stan Sol Lye 780 c c

Same as No. 384, only increase of 5 C C of Lye per 100 C C Oil, acted similar to No. 834. This was made nearly c. p.

185

No. Metallic Soaps. 8/27/88.
841 Cocoa Nut Oil.....1000 grms.
Stan Sol Lye 600 c c

Saponified by continued application of heat, but did not give clear solution in water, even after prolonged boiling—a hard white scum formed on top of solution. Precip'd by acetate lead to white mass adhesive when hot, hard and granular when cold.

186

8/30/88.
842 Cocoa nut Oil.....100 gm.
Sol lye sp gv 1.40..... 50 c c

8/30/88.
843 Cocoa nut oil.....100 gm.
Oleic acid..... 5 "
Sol Lye 40 c c

187

No. Metallic Soaps 8/30/88.
844 Stearic Acid.....100 gm.
Cocoa nut oil..... 50 "
Oleic acid..... 10 "
Sol Lye 1.40 sp. gv..... 48 c c

188

8/30/88.
845 Stearic acid.....100 gm.
Cocoa nut oil..... 50 "
Oleic acid..... 15 "
Lye Sol. 1.40 sp. gv..... 49.5 c. c.
846 Stearic acid.....100 gm.
Cocoa nut oil..... 50 "
Oleic acid..... 20 "
Lye Sol. 1.40 sp. gv..... 51 c. c.

No. Metallic Soaps. 8/31/88.
847 Cotton seed oil.....100 gm.
Sol. Lye..... 80 c. c.

Saponified with difficulty to yellowish soap. Clear sol. percipated by $C_4 H_6 Pb. O_4$ to sticky mass. When

189

melted Pb. O reduced. Probably too much Lye was used, that is not all the fat saponified and what did took hog share of lye, which is substituted by equivalent quantity of lead when precipitated.

848 Cotton seed oil.....200 grm.

Lye Sol. 1.4 sp. gv. 80 c. c.

Saponified sim. to No. 47. Precipitated by acetate lead to white sticky mass. When melted resembled

190 oleate of lead, except slightly yellow color.

No. Metallic Soaps. 8/31/88.

849 Cotton seed oil 100 grm.

Stearic acid 100 "

Oleic " 50 "

Sol. Lye 1.4.....100 c. c.

Saponified like 47 to clear solution, precipated by $C_4 H_6 Pb^{11} O_4$ to sticky white mass, melted down to crumbly rotten mass.

191

8/31/88.

850 Stearic acid 100 grm.

Cotton seed oil 66.6 "

Sol. lye..... 62 c. c.

Saponified with difficulty to hard granular soap, clear solution. Precipitated by lead acetate to rather flaky mass. Rather rotten when melted down, cut fair, but weak.

192

No. Metallic Soaps. 8/31/88.

851 Stearic acid.....100 grm.

Cocoa nut oil..... 44 "

Oleic acid..... 22 "

Lye solution 49.80 c. c.

Saponified with difficulty to granular dirty white soap. Fairly clear solution. Precipitated by acetate lead to finely divided white mass. Melted—clear & hard gray, powdery cut when cold.

		8/31/88.	193
852	Cocoa nut oil.....	44 gm.	
	Stearic acid.....	100 "	
	Oleic acid.....	30 "	
	Sol. Lye.....	30 c. c.	
	Acted like No. 51 & appeared the same, slightly less powder to cut.		
No.	Metallic Soaps.	8/31/88.	
853	Stearic acid.....	100 gm.	194
	Palm oil (crude).....	44.5 "	
	Cotton seed oil.....	22.5 "	
	Sol. Lye 1.40°.....	67 c. c.	

8/31/88.

A serious obstacle was here found in all cylinders made of cocoa nut oil, palm oil, cotton seed, and in fact all the oils and fats, in the shape of minute bubbles which could not be seen by the naked eye, but could be very distinctly heard in the phonograph as a crackling and scratchy noise, and could be seen under the microscope. These were found after a series of experiments to be caused by glycerine decomposing slowly while the wax is melted, giving off ackrolene & water, also to the vaporisation of the glycerine. It was found that glycerine always occurred in the wax unless it was especially well made, and washed with alcohol after precipitating or other processes, which would make it too expensive for practice. The point at which these bubbles formed could be raised by heating the melted wax very hot and letting it settle and then to the temperature required in molding, but this operation spoiled the quality of the wax, and then great care had to be taken to run it high enough each time and not to let it get too high in molding, which altogether made it impractical. So the only way left was to use fatty acids and not neutral fats or oils.

No. Metallic Soaps

854 Sticky oxidised linseed oil, 200 grams heated with 70 C C of 1,400° lye solution, boiled to dryness,

197

then water is added and boiled until it looks like soft soap ; then it is precipitated by acetate lead.

855 Same solution as 854, precipitated by alum.

No. Metallic Soaps

856 Stearate of alumina made by fuseing stearic acid and chloride of alumina together adding the latter little by little until the mass becomes thick, even at high heat.

198

856 *Stearate of Soda.*

Made by adding dissolved caustic soda to melted stearic acid. It must be added slowly to the acid, and after same is added the higher stearate formed is allowed to dissolve in the stearic acid, more heat being applied as the melting point of the mass raises, or as more soda is combined with the stearic acid. To 1000 grms. of stearic acid about 100 grms. of NaHo (Lewis) was used. This makes a soap, of a light brown color, with a very high melting point, which when poured out and cooled becomes amorphous on the cooling surface, but crystalline on inside. It is almost perfection on the phonograph (the amorphous outside) as far as articulation cut and scratch are concerned, but when the cooling surface has been cut through it becomes scratchy and no good, also it will absorb moisture on hot damp days, which would spoil any record put on it.

200

No. Metallic Soaps

858 Stearic acid.....	500	} Dissolved in H ₂ O together
NaHo (Lewis)	37	
Acetate Al. (Sic).....	18	

The object of this experiment is to take the crystallization out of stearate of soda, and to make it mold better. It come out bang up, non crystalline, good cut, molded first class, but was electrical. Not so likely to absorb moisture.

201

859 Stearate of soda No. 857, melted with about $\frac{1}{8}$ stearate of Mg (made by adding acetate of Mg. or common magnesia to fused stearic acid, until a transparent amorphous mass is obtained which has a slightly brownish yellow color) This makes a wax with a very good cut, non electric, strong, but hard, too high a melting point to be practical.

860 Stearic acid..... 1000 grm.
Acetate of Barium about 100 grm. Fused together.

202

Forms a hard high melting point amorphous solid which has a poor cut.

860 $\frac{1}{2}$ No. 860 with free stearic acid.

861 No. 860 mixed with No. 857 in various proportions, proportions none of which were as good as No. 858.

862 *Stearate of Strontium* made same as No. 860, which it much resembles.

203

(Note on page opposite Expers. Nos. 863 and 864.)

It was afterward found that No. 864 changed on surface after standing a while. becoming porous. It is really a mixture of a compound of stearate of Al & acetic acid, the latter of which evaporates, when No. 864 is heated very hot it loses its white waxy appearance, and becomes distinctly crystalline. This has a remarkable contraction when cooled in saucepan.

204

No. Metallic Soaps

863 Stearate of Strontium mixed with No. 857 in various proportions. Good but not equal to No. 858.

864 Stearate of Al. (white)

To fused stearic acid acetate of Al is added until a white hard non-crystalline, cohesive to cut, wax is ob-

205

tained. It forms a liquid about as thick as No. 857, which solidifies at very low tem., in fact it can be poured in the hand and left to cool, but when once solid its melting point is very much higher. Molds good, is insoluble, talks good, cuts good, contract scarcely any in mold, less scratch than 857, very electrical.

No. Metallic Soaps

206

865 Stearate of Lead mixed with various proportions of stearate of alumina.

None of them equaled No. 858.

866 Stearo sulphurett of Soda.

Made same as No. 857, except hydro sulphurett of soda (NaSO) is used in place of NaHO . This gives very good wax, which is very similar to No. 1, and if anything better. But No. 858 is better and more practical.

207

867 Stearic acid.....	1200 gm.
Lewis Lye (Com.).....	900 "
Acetate Al (Sic).....	433 "

208

Acetate of alumina and Lewis' lye are dissolved together in water, so as to make a concentrated solution. The stearic acid is melted in iron kettle and heated to 240°F , then the solution is added same as in No. 857, the temperature ranging between 240° to start and 380° at finish. This is cooked a day and a half or until bubbles stop coming; this is intended as a duplicate of No. 858, except a little more soda and alumina is added. Came out same as No. 858, except a little better. It was of a reddish color due to iron kettle. This material when cooked at a high temperature (400°F) is much improved, but is rendered less easily molded, on account of the melting point raising.

This wax seems all right except if a very deep track

209

is made by the phono needle, it chips out; seems to be a little too much Al in it.

868 Stearic acid.....2,000 gm.
Acetate Al (not sic).....72 gm.
Lewis lye.....155 gm.

Done same as No. 867, except it was done in dish pan. This was a slight improvement on No. 867.

210

869 No. 867 with a little lye and stearic acid added. This is much better and only remains to get correct proportion to make it O. K.

870 No. 867 heated up to 500°F for some time. Somewhat improved.

871 No. 867.....300 gm.
Stearic acid.....50 gm.
Caustic soda.....5 gm.

This is very good in all respects and when filtered is perfection almost. 211

872 No. 871 Duplicated.
Came out the same.

873 Stearic acid.....50 gm.
No. 867.....500 gm.
Caustic soda.....10 gm.

Very good only little harder to mould and filter than No. 871. 212

874 Third duplicate of No. 871--came out all right.

875 Fourth duplicate of No. 871. Caustic soda and acetate of Al dissolved in water same as 867, this is filtered, and when measured out equaled 2370 C C of 1, 3800° Sp Gv. at 80°F.

Stearic 1400 gm.
Soda 1100 gm.
Al 440 gm.

213

In making, the temperature did not exceed 380°F. After all the solution had been taken up it was kept at about 360 or less for half a day. It took 1½ days to make.

876 No. 871 is melted and heated to 360°F, then filtered through filter paper in oven, filters very slow, about a drop in two seconds or less. Makes perfect cylinder when filtered.

214

877 On moulding No. 871.

The material is melted and heated pretty hot, until it gets dark in color; this is then filtered through Chinese napkins and molded in mold heated to 130°F. The mold was not hot enough and the consequence was a seam down the side of cylinder when the wax was first poured in.

215

878 Same as No. 877 except it is molded in old mold with cold core and shell heated to 130°F. Shell was wrapped with asbestos paper. This came out fairly good.

879	Tem. of wax	329°F.
	" " mold (shell)	212°F.
	" " " core	212°F.

Molding.

216

880	Temperature of wax	350°F.
	" " Mold (shell)	212°F.
	" " " core	90°F.

Time left in mold before withdrawing—18 min. The wax was poured in first. This cylinder was better than No. 879, but had sunken in places on outside of cylinder, caused I think by air bubble, which is greatly expanded while hot, and which collapses when cold, the bubble might be very deep in the cylinder.

217

Molding No. 871.

881 Tem. of mold (shell)-----	72°F.
“ “ “ (core)-----	72°F.
“ “ wax-----	360°F.

Mold is jacketed with asbestos on the outside. Material poured in fast. Stayed in 10 min. when water was poured on inside of core to cool it, so that it could be withdrawn, came out fairly good, but was slightly sunken in large spots.

218

882 Tem. of Mold (shell)-----	90°F.
“ “ “ (Core)-----	90°F.
“ “ Wax-----	350°F.

Used the thin core belonging to old mold of white old reg.

Molding No. 871.

883 Tem of mold-----	70°F.
“ of wax-----	350°F.

219

Heavy core, wound with thread, Clarks No. 30 spool cotton. This molded very good, there was slight seam left in one side when the stuff was poured in. The core came out nicely leaving the inside beautiful.

884 Tem of wax-----	350°F.
“ “ mold (shell)-----	140°F.
“ “ “ (core)-----	80°F.

220

Heavy core, wound with Clark's spool cotton No. 24. Poured in wax medium fast. Came out very good except for slight roughness on surface.

On molding 871.

885. Same as No. 884 except inside of mold (shell) is polished and gate is heated to 300°F.

886 Tem. of mold (shell)-----	120°F.
“ “ “ (core)-----	78°F.
“ “ “-----	325°F.

221

Core wound with No. 40 Clark's thread inside of shell or mold lined with parchment paper. Came out wrinkled from the warping of the paper, but wrinkles were fine and not very deep. No seem was left on cylinder. Very good.

Molding No. 15.

887 No. 15 (not filtered)

222 Tem. of mold (shell) 130° F.
 " of " (core) 130° F.
 " of wax 350° F.

Core wound with No. 40 Clarks' thread. Inside of mold lined with writing paper. Came out with less wrinkles but what there were, was very deep and long.

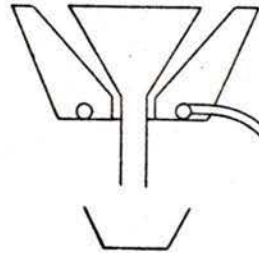
888 Temp. of mold 100° F.

Temp. of wax 325° F.

223 Cotton thread wound core, inside mold lined with tissue paper. Wax run on both sides of paper. No good.

Filtering No. 871.

889 Filter heated by gas shaped thus—



224

Tem. of wax in filter 350° F.

Amount per hour 10½ oz.

Common filter paper was used.

890 Same as 889, only this is result of second hour, only about half as much came through.

225

891 Large size cylinders weigh $3\frac{3}{8}$ -oz. just they come
out of the mold, or $96\frac{1}{2}$ gm.
30.9 lb. wax = 144 cylinders.
30.9 lb. = 14000 gm.

(Note on page opposite Expers. 892, 893 & 894.)

Standard solution of Ley and Alumina Acetate.

Lewis Soda.....1100 gm.

Acetate of Al (dry).....440 gm.

Dissolved in enough water to make sp. gv. equal 226
1,3800 at 80° F. after filtering.

Molding.

892 The best proportions for No. 871 are—

To 14000 gm. stearic acid, use 2370 C. C. of
Standard solution of ley (see opposite.)

893 Cylinder molded same as No. 881, except core is
wound with thread and gate of mold is heated 227
to nearly same tem. as wax. After filling the
gate with wax opened the gate and let it go in
as fast as it would, pouring at same time.
Came out bubbly.

894 No. 871 filtered through twill. Wax at about 360°
F. in filtering—came through fairly fast.

Molding & Filtering.

895: Tem. of mold.....200°F 228

“ “ wax.....340°F

“ “ gate.....300°F

Core thread wound, inside of mold lubricated with
glycerine after cylinder is cold it is coated on inside
with elastic laquer (gun cotton in acetate of amyl) to
make the thread stick tight. Any color could be given
to the inside in this way, by dissolving the colors in
the lacquer. The thread stuck very well.

229

896 Done in gas heated filter.

Tem. of wax.....330°F

Used twill muslin as filter medium. Amount per
hour 1 lb. 2¼ oz.

Filtering & Molding.

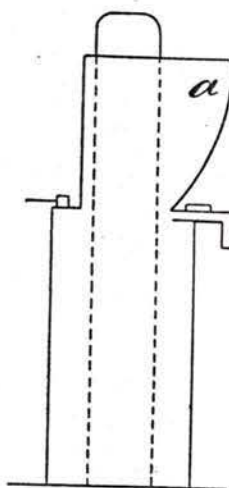
897 Same as No. 896, with a new rag and temperature
a little hotter.

Amount per hour, 2 lb. 3 oz.

230

898 Molded in large gate mold as shown.

231



Thread covered core.

The gate (a) filled up with the
cut off closed, then the cut off
opened, and gate filled up again.

Tem of wax.....240°

" " mold.....212°

" " core.....100°

" " gate.....240°

Molding.

899 Same mold as in 898.

232

Tem. of wax.....340°F

" " mold.....55°

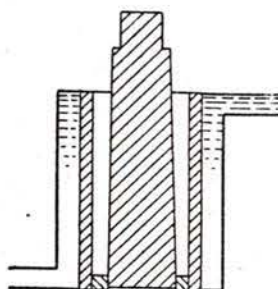
" " core.....100°

" " gate (a).....240°

Core thread wound. Gate filled with cut off closed,
then gate opened and filled again, to give pressure to
that which is already in.

233

900 Mold made with jacket on outside to pass cold water, or steam as the case requires.



Sect. of Mold.

The mold was warmed a little and the wax poured in at 360° immediately after wax was poured cold water was forced through the jacket; the cylinder came out a true cylinder, perfect, not a rough place on outside, too expensive.

234

Molding.

901 Mold wrapped on outside and in the center with copper wire, so as to give more mass of metal at center, and to keep the cylinder from warping in center. Worked in a measure.

902 Core covered with paper, ordinary newspaper. Came out nicely, but cracked when it became cold. 235

903 Core wound with heavy string—cracked.

904 Core wound with silk thread—did not stick good.

905 Core wound with spirral strip of paper—good, no cracks.

906 Core thread wound, poured at regular tem. (350°-360°) in slightly warm mold. 236

Cylinder left on core until it has become dead cold. It did not crack and was perfectly true inside. Cooling in this way will insure perfect fit on mandrel of phonograph.

907 Core not thread, wound, poured at regular tem. in slightly warm mould. Left in until dead cold. Came out all right—did not crack, in others tried in this way, some of them did crack however.

237

908 Core wound with copper wire, came out very good but the expense of wire is too great.

909 Core wrapped with muslin—came out fairly good, but cracked after it had stood several days.

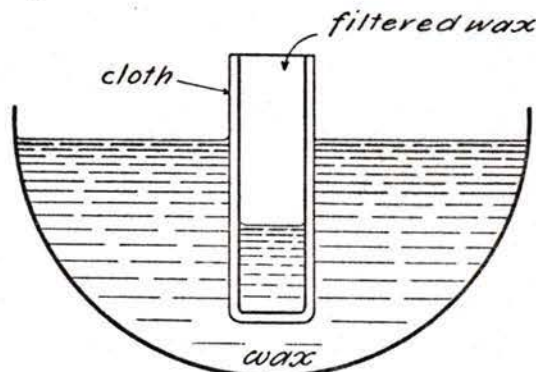
238

910 Wax heated to 500° poured at this tem. into cold mold. The idea of this is to see if the mold wont stay liquid enough while in the mold, to allow the bubbles to raise to top. Bubbles were found in the cylinder, mostly fine ones, the larger ones having risen.

Filtering # 871.

911 A cylinder is made of iron netting about 8 in. diameter and 1½ ft. long, this is covered with muslin (twill) and sunk into molten wax, the top being left open. Following is view of filter in wax.

239



240

This arrangement filters more than 10 lb. to the hour.

Molding # 871.

912 Old thin cylinder mold was used, it having a thin shelled core.

Tem. of mold 60°

" " wax 340°

Poured in medium fast. This cylinder came out perfect. From this experiment it shows that

241

the thickness of the core in relation to that of the outside mold has a great deal to do with the sunken in places of the cylinder.

On Making # 871 non-electric.

913 # 871..... 100 grm.
Balsom (Canada)..... 5 "
Softened it some, but improved the cut. Taking electrical property of # 871 as 10, this one would come out about 7. 242

914 No. 871..... 100 grm.
Canada Balsom..... 5 "
Very good wax, polish cut, more cohesive
Electrical—about..... 8

915 No. 871..... 100 grm.
Camphor..... 5 "
Bang up—electrical—about 5. 243

Making 871 non-electric.

916 No. 871..... 100
Caramel..... 5
No good.

917 No. 871..... 100
Salicylic Acid (amorph)..... 5

918 No. 871..... 100
Benzoic Acid..... 5 244

919 No. 871..... 100
Gallie Acid..... 5

920 No. 871..... 100
Pyro Gallie Acid..... 5

921 No. 871..... 100
Tannic Acid..... 5

245

On non Electrifying No. 871.

922 No. 871..... 100

Alpha Napthol..... 5

923 No. 871..... 100

Silicate Soda..... 5

924 No. 871..... 100

Chloride Zinc..... 5

246

926 No. 871..... 100

Alum..... 5

927 No. 871..... 100

Borax..... 5

928 No. 871..... 100

Venice Turpentine..... 5

929 Chloride of Ammonia..... 5

247 No. 871..... 100

930 No. 871..... 100

Arcenious acid..... 5

931 No. 871..... 100

Tungstate Soda..... 5

932 No. 871..... 100

Molybdric acid..... 5

248

933 No. 871..... 100

Zinc Oxide..... 5

934 No. 871..... 100

Chromic Oxydat..... 5

935 No. 871..... 100

Talc..... 5

936 No. 871..... 100

Fe Chromic..... 5

937 No. 871.....	100
Camphor.....	24

249

(Note appearing on page opposite Exper. No. 937)
Considerable softer than No. 871, about as soft as
carnauba 100, cerasin 30,—Hardens on surface after
time.

On Non Electrification of No. 871.

938 No. 871.....	100
Camphor.....	10

250

939 Stearate of soda.....	100
Camphor.....	10

940 No. 871.....	100
Camphor.....	5

941 No. 871.....	100
Cofabia Balsom.....	7

251

942 Cofabia Balsom.....	5
No. 871.....	100

(Note on page opposite to Expers. Nos. 938,
939, 940, 941, and 942)

Too soft

Crystalline

252

The best yet. Scarcely any electrification, while
No. 871 is terrible. Probably this great change is
caused by the evaporation of camphor which carries
away the electricity. Not practical, as the camphor
will evaporate, leaving a poor surface.

The best talking up to now obtained is this one, not
a sound to be heard other than the talking with the ex-
ception of slight crackling here and there. Somewhat
electrical.

253

943	No. 871.....	100	}	100
	Cofabia.....	5		
	Camphor.....	5		

(Note on page opposite Expers. Nos. 943, 944,
945, 946, 947, 948, and 949).

BANG UP!!!

254	944	No. 871.....	100
		Oil mace.....	5
	945	No. 871.....	100
		Fatty oil cassia.....	5
	946	No. 871.....	100
		Oil cassia.....	5
	947	No. 871.....	100
255		Balsom Sulphur.....	5
	948	No. 871.....	100
		Tyinol.....	5
	949	No. 871.....	100
		Red Cedar Oil.....	5
	950	No. 871.....	100
		Cofabia.....	3
		Camphor.....	5
256	950½	No. 871.....	100
		Cofabia.....	5
	951	No. 871.....	100
		Rosin from Balsom Cofabia.....	5
		Camphor.....	5
	951½	Stear.....	2000
		Stand Sol.....	475 C. C.

257

952 No. 871 is adapted as regular and lot made in phonograph works.

63425 grm-Stearic

Stand solution 15063½ C. C.

Came out good, but was pinkish from the iron of kettle.

DEC. 6, 1888.

On Preserving Records of Sounds on Wax Cylinders.

953 The idea is to coat the cylinders with a thin film, 258

that will not wear under the influence of the (receiver or reproducer) stylus, or by handling etc. Such a film might be a separate compound as colodion varnishes, silicates (soluble). This might be applied by brush or by dipping in solution of the film required, the solvent afterward drying and leaving the film on surface of wax. Or the cylinders might be composed of asphalt compounds or something which, when afterwards treated, would become hard on surface. This might be done by pentichloride of antimony and other chemicals. 259

(Notes appearing on page opposite Experts. Nos. 954 and 955).

Some difficulty was encountered in the shape of bubbles which would form in putting it on. The talk was not harmed.

Dried quicker and came about same as No. 954. 260

954 Guncotton applied in solution of alcohol, ether and acetate amyl, by a camel's hair brush, the cylinder being revolved while applying the solution.

955 Solution of guncotton in acetate of amyl, ether and alcohol, less amyl being used than No. 954. Must be applied quick and not rubbed

261

much with the brush. To be continued when have more time.

(Note on page opposite Expers. Nos. 956 & 957).

This made everything O. K. and was excepted by Mr. E. as regular for the time being, or untill something better turned up.

Softening No. 871.

262 956 Trouble was found in working No. 871 in phono works, as it would not turn smooth in the knives we had, and when they did get a good knife it would not keep in good condition long, making it impractical to work, so the following experiments were made to soften No. 871 a little:

2000	gram.	-----	Stearic
200	"	-----	Red Oil
500	C C	-----	Standard Solution.

263

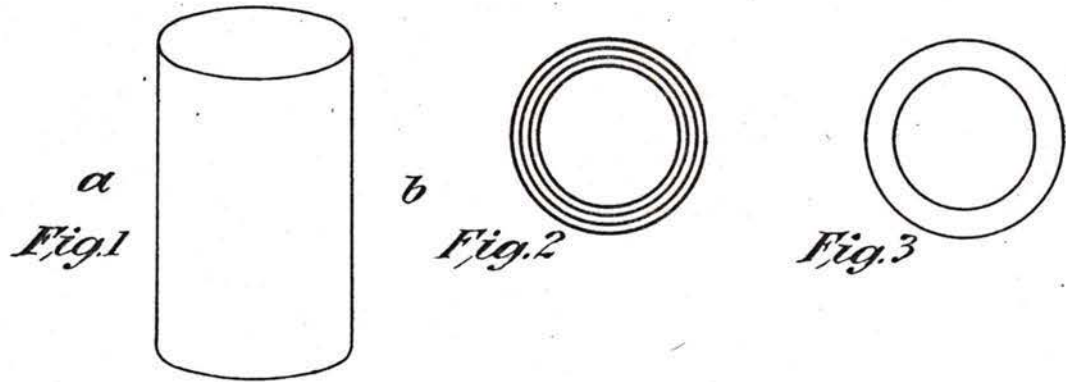
957	Stearic acid	-----	3000	gram.
	Red Oil	-----	150	"
	Stand Solution	-----	750	"

Crystalline, but gave good cut on cooling surface (little soft) too much solution used. Gave remarkable phenomonon in crystalization. Fig. shows elevation of cylinder, Fig. 2 Section—

a-b of Fig. 1. Fig. 3 shows plan.

264 In Fig. 2 each dark ring indicates the amorphous layer and space between the crystalline part; there were 4 distinct layers of amorphous wax, which extended all the way around the cylinder, 2 being inside the wall.

265



266

Improving No. 871.

958 Stearic Acid (very crystalline).....	500	gm.
Spermaceti	150	"
Stand Solution.....	170	c. c.

(Note on page opposite Expers. Nos. 959-964 inclusive)

Very hard and cohesive, and not nearly so electrical as No. 871.

267

Improving No. 871

959 Stearic acid (very crystalline).....	500
Linseed Oil Boiled.....	30
Stand solution lye.....	170 c. c.

960 No. 871.....	100
Spermaceti	12

268

961 No. 871.....	100
Syr. Asphalt.....	10

962 No. 871.....	100
Syrian Asphalt.....	5

963 No. 871.....	100
Syr. Asphalt.....	20

269

964 No. 871.....	100
Soft Mex. Asphalt.....	5

Improving 871.

965 No. 871.....	100
Soft Mex Asp.....	10

966 No. 871.....	100
Soft Mex Asphalt.....	20

270

967 No. 871.....	100
Soft Mex. Asphalt.....	5
Sulphur.....	$\frac{1}{2}$

968 No. 871.....	100
Camphor and guncotton.....	5
(see opposite) *	

(Note on page opposite Experts. Nos. 965 to 969 inclusive)

271 * Camphoric guncotton is the product formed by adding guncotton to hot melted camphor. The guncotton seems to decompose and dissolve in the camphor. Makes an amorphous tough yellow waxy mass.

969 No. 871.....	100
Camphoric guncotton.....	10

Improving No. 871.

272 970 No. 871.....	100
Linoleic Acid.....	$1\frac{1}{2}$

971 Camphor melted and boiled with HMO_3 until it turns black. HMO_3 is renewed from time to time.

972 No. 971 with guncotton dissolved into it while melted.

973 Camphor and linseed oil mixed and oxydised by nitric acid.

Defendant's Exhibits.

103

273

974 No. 871..... 100
No. 971..... 10

975 No. 871..... 100
No. 971..... 5

Improving No. 871

976 No. 871..... 100
No. 973..... 3

274

977 No. 871..... 100
No. 972..... 5

978 No. 871..... 100
No. 972..... 10

979 No. 871..... 100
High oleate of Lead..... 5
(see Opposite) 979 (b) *

275

(Note on page opposite expers. Nos. 976 to 80 inclusive)

979 (b)

* *High Oleate of Lead* is formed by saponifying oleic acid with all the potash of soda it will take and precipitating by acetate of lead. Has been dissolved in naphtha and the naphtha evaporated.

980 No. 871..... 100
Soft Mex Asphalt..... 10
Sulphur..... $\frac{1}{2}$

276

981 Sublimate obtained when camphor is boiled with HMO_3 , saponified by potash.

982 Stearate of soda (nutral) in which acetate of amyl has been poured, in the hope of making stearate of amyl.

983 Some of solution of 982 precipated by acetate of lead solution.

277

984 No. 972 dissolved in alcohol, for varnish,
beautiful.

985 No. 971 oxydised more, dissolved in alcohol.

Improving 871

986 Stearic acid in fusil oil, with HCl gas passed
through, might make stearate of amyl.

278

987 No. 871 100
Acetate Amyl 4

988 No. 871 100
Acetate of amyl 10

989 No. 871 100
Guncotton in amyl acetate 5

279

990 No. 871 100
Guncotton in amyl acetate 10

991 No. 871 100
Sulphide of antimony 5

Improving 871

992 No. 871 100
Sulphide of antimony 10

280

993 No. 871 100
Sugar 10

994 No. 871 100
Sugar 5

995 No. 871 100
Chloride Strontia 5

996 No. 871 100
Chloride Strontia 10

			281
997	No. 871.....	100	
	Hydro Sulphurett Rubrum	5	
998	No. 871.....		
	Hydro Sulphurett Rubrum	10	
	Improving 871		
999	No. 871.....	100	
	Sulphur	1	282
1000	No. 871.....	100	
	Sulphur	2	
1001	No. 871.....	100	
	Sulphur	5	
1002	No. 871.....	100	
	Sulphur	10	
1003	No. 871.....	100	283
	Sulphur	20	
1004	No. 871.....	100	
	Sulphur	30	
1005	No. 871—100+ammonia Phosphoric.....	5	
1006	No. 971—100+ammonia Phosphoric.....	2	
1007	No. 871—100+ammonia Phosphoric	10	284
	(Note on page opposite Experts. Nos. 1008 to 1012 inclusive).		
	Made a very amorphous mass, though perfect cut, transparent mass which afterwards dried and cracks.		
	1008 No. 871—100 + Potassia Sulphurett 2.		
	1009 No. 871—100 + Potassia Sulphurett 7		

285

1010 Wool is dissolved in KHO solution, one part wool to three KHO and oxydised by two parts permanganate potash. The solution decanted and filtered. CO_2 is passed through to neutralize excess of pottash. Then it is precipitated by acetate of lead.

1011 Camphor dissolved in alcoholic potash and oxydised by permanganate potash.

286

1012 Tartaric acid is melted direct with tri hydrate of alumina.

Improving 871.

1013 Stearate of alumina (nutral) made in wet way.

1014 Hypo phosphite (or perhaps) the phosphate of soda has a remarkable effect on carnauba wax, making it softer with nice cut, violent action takes place when heat is run too high.

287

1015 Melted Stearic Acid in dish that had previously had NaHO in it (but dish was rinsed out) then added chromic oxide (chromic acid) after stirring it exploded with bright yellow flame for an instant just like metallic sodium would in hot water. Afterward found that the soda had nothing to do with it. A string dipped in stearic acid at about 150°F . and sprinkled with chromic acid burned with a light almost equal to oxygen-hydrogen-calcium light. Might make candles in this way. A small wire sponge on end of wire, dipped in alcohol and then in solid chromic acid burns—good cigar lighter—found to be impracticable.

288

Useful Determinations.

1016 Amount of Lewis lye in 100 C C of solution of 1,340 Sp. Gv. at 78°F . = 43.10 grm. Lewis' lye of 1,200 contains 100 grm. dry lye in 425 C C of solution.

289

1017 Amount of Lewis lye required to make nutral
stearate of soda—

Stearic acid.....	100
Soda	17
(Anhydrous NaHO)=	(12.5)

1018 Amount of Al_2O_3 in standard solution = 7.0584
gram. to 100 gram. Lewis dry soda.

Determinations.

290

1019 Amount acetate of alumina in standard solution =
40.8 gram. to 100 of dry Lewis' soda.

1020 Amount of Trihydrate of alumina in standard
solution = 10.766 gram. to 100 gram. dry Lewis'
soda. The per cent of Na_2O in nutral stea-
rate of soda = 12.7.

(Note on page opposite Exper. No. 1022)

Not $\frac{1}{2}$ scratch of regular—make splendid musical
cylinder, very hard, will probably require saphire cut- 291
ters—cant be filtered well—molds nicely—only keenest
edge on recorder can be used on account of hardness,
can track deep, works well as a thin or thick veneer.
Low melting point, pours low temperature. The
cylinder I tryed was filtered.

EDISON.

A Hard wax for musical cylinders.

MAY 30, 1889. 292

1022 Purified Cake Bees Wax	500 gram.
Carnauba (first grade)	400 "
Dry acetate of Alumina.....	40 "

Cook well to get off acetic acid. Color light brick
red—there is considerable precipitated alumina un-
combined in the wax which causes the material to filter
slowly.

(Note on page opposite Exper. Nos. 1023 to 1025 in-
clusive.)

293

Talks very good, noiseless, smooth, hard, insoluble, loud talking, and in fact perfect except the chips wont go through chip box on account of their peculiar nature.

Musical Cylinder.

1023	Carnauba	500	} 100
	Stearate A1	100	
	Cerasin	20	

294

1024 Made same as No. 871 except Mitchells stearic acid is used which is much harder—made very hard and in fact too hard wax.

1025 No. 1024 softened by bees wax in the proportion 100 of No. 1024 to 20 bees wax—very good musical.

PREVENTING REG FROM BEING SOLUBLE IN MOISTURE.

295

1026 It was found that the cylinders made from Regular (No. 957) were attacked by moisture of the air. This was a very serious matter, as records on cylinders became spoiled and the cylinders that were sent out made of this material had to be called back. At the time No. 957 was introduced it was cool weather and they were not affected, but when the hot moist summer weather came, cylinders exposed to it, were badly corroded on surface.

296

MOISTURE PROOFING REGULAR.

1027 Oleic acid or rather the oleate of soda formed in the wax was found to be the cause of wax being affected by moisture.

1027 The stearic acid we were getting at the time was found not to as good as that bargained for, it contains oleic in considerable quantity, samples

297

were obtained from Mitchell & Co. which
were very hard and free from oleic.

No. 871 (Made from Mitchell)..... 100
Cerasin..... 5

(Note on page opposite Expts. Nos. 1028 to 1029
and 1029)

This is O. K. absolutely not affected by moisture,
can be soaked over night in water without showing it.
Talks even better than old Reg and makes an excellent 298
musical cylinder. Molds O. K. and at lower tempera-
ture. Excepted by Mr. Edison as regular.

WATER PROOFING REGULAR WAX.

1028 No. 871 (made from Mitchells Stearic) 100
Cerasin..... 10

1029 No. 871 (made from Mitchells Stearic).....100
Cerasin..... 20 299

1029 No. 871 (made from Mitchells stearic).....100
Cerasin..... 30

(Note on page opposite experiments Nos. 1030 to
1033 inclusive).

Plant having 500 lb. per day capacity was started
for making No. 1030.

Does not duplicate Reg.

Improving 1029.

300

1030 The idea of this experiment is to see if we can't
do away with the expensive acetate of alum-
ina.

1030 Mitchells Stearic acid.....1000 grm.
Lewis Lye..... 170 "
Precipitated by alum washed and dried.

1031 Mitchells Stearic.....500
Lewis Lye..... 40

301

1032	No. 1031.....	100
	No. 1030.....	10
1033	No. 1031.....	100
	No. 1030.....	15

(Note on page opposite experiments Nos. 1034 to 1039 inclusive).

This duplicates No. 871 (made from Mitchells stearic acid) except no acetate is used in it—makes quicker and easier.

IMPROVING REGULAR WAX.

1034	Stearic Acid (Mitchells).....	400
	Lewis Lye.....	36
1035	No. 1034.....	100
	No. 1030.....	10
303		
1036	No. 1034.....	100
	No. 1030.....	15
1037	Stearic (Mitchells).....	400
	Lewis Lye.....	40
1038	No. 1037.....	100
	No. 1030.....	10
304		
1039	No. 1037.....	100
	No. 1030.....	15
1040	Stearic (Mitchells).....	500
	Lewis' Lye.....	35
1041	No. 1040.....	100
	No. 1030.....	10
1042	No. 1040.....	100
	No. 1030.....	15

Defendant's Exhibits.

111

305

1043	No. 1034	100
	No. 1030	15
	Cerasin	5
1044	No. 1034	100
	No. 1030	15
	Paraffine	5

(Note on page opposite Experiments No. 1045 to 1048 inclusive)

306

This is an exact duplicate of Reg (1029) and is much cheaper and easier to make. The acetate of alumina being done away with. Excepted by Mr. Edison.

IMPROVING REGULAR WAX.

1045	No. 1034	100
	No. 1030	15
	White wax	5

307

1046	No. 1034	100
	No. 1030	15
	Cerasin	30

1047	No. 1034	100
	No. 1030	15
	Cerasin	20

1048	Mitchells Stearic	100
	C. P. NaHO	9
	Cerasin	20
	Stearate Alumina	15

308

1049	No. 1048	100
	Boiled Cofabia	10

1050	No. 1048	100
	Cofabia Balsam	5

1051	No. 1048	100
	Rosin	5

309

Note on page opposite Experiment No. 1052)
After standing sometime, these cracked, that is some
of them.

veneer cylinders.

1052 Made for veneer cylinders for Wangemann to
take to Europe. Strained through heavy
filter cloth.

310

Bees wax.....	10395 grm
Carnauba.....	8316 "
Dry acetate of alumina.....	831 grm

The acetate is added in small lots and well stirred.
Tem not exceeding 500.

PLASTER PARIS AND THIN SHELL EXPERIMENTS WITH NO. 1029 AS WAX.

311

1052 $\frac{1}{2}$ Cylinders dipped on polished brass mandrell,
larger size and smaller taper than ordinary
mandrell; the cold mandrel is dipped in the
wax (305°F.) and left on mandrell until cool—
mandrell was oiled with castor oil, the shell
of wax came of mandrell and did not crack.

1052 $\frac{1}{3}$ Dipped in same wax No. 1052 $\frac{1}{2}$. Temperature
310°. Oiled mandrell. Dipped $\frac{1}{2}$ min. left
on mandrell until cool=hr. the temp. of room
89° b. was left on mandrell over night.

312

1052 $\frac{1}{4}$ Dipped same as 1052 $\frac{1}{3}$ cooled in cold water,
surface of wax scarcely attacked by the H₂O.

1052 $\frac{1}{5}$ Temp. wax 320°, temp. of room 89°. Dipped
 $\frac{1}{2}$ min. left on mandrell 1 hour.

Idea of above thin shells is that they are
used as the outside mold with a core inside,
in which plaster of paris is poured and set
between shell and core so as to form a back-
ing for shell. Works good for music, but crack
in cold temperature.

313

MAKING VENEERS.

1053 Asphalt cylinder is dipped (on brass mandrell) in number 1046 at as low a tem. as the wax will stand without forming scum on surface, and held a length of time which shall depend on the thickness of the veneer wanted. Veneers can be made $\frac{3}{32}$ " thick in this way. The asphalt cylinders have to have their surface prepared with some substance such as 314 rubber, bolletta, gum, dissolved in some solvent which will evaporate in order to insure the wax to stick. They will not crack when they stick.

(Note on page opposite Exper. No. 1054.)

This is flexible, good cut, dry, not scratchy. After standing a month, it was found to become quite brittle, might make some alteration in it to prevent this.

315.

MAILING CYLINDER.

1054 Guncotton dissolved in ether and alcohol, treated with proto chloride of tin and powdered gum euphorbrium filtered, dried and redissolved in alcohol and ether+acetate of amyl, with nutral stearate of alumina dissolved in whole, then filtered and dried on sheets of paper or dipped on shells of some material for a backing.

316

(Notes on page opposite to Experiments Nos. 1055 to 1058 inclusive.)

Too much carbonate, would not all dissolve, and made high melting point wax.

Quite good, but not quite enough carbonate.

All O. K. Exact duplicate of Reg made other ways and much cheaper and quicker made.

317

Aug. 14, 1889.

Another Improvement on Reg.

1055 Stearic Acid.....	500	gram.
Crystalized carbonate soda.....	202.5	gram.

1056 Stearic Acid.....	500
Carbonate Soda.....	140

318 1057 Stearic Acid.....500 gram.
 Carbonate Soda (cryst.).....150 gram.
 Crystals washed and powdered in mortar, and
 added to melted stearic little by little. Melts at
 230° F.

1058 Number 1057.....	100
Stearate Al.....	15
Cerasin.....	30

319 1059 It was found that the washed crystals can
 be used in making number 1058 with-
 out grinding them up, which makes it
 cheaper yet. The crystals come @ 1½c
 lb., they are picked over and wash those
 which are dirty, dissolved and recrystallized,
 which is a very small per cent.

1059½ No. 1058 with stearate Al made in a large
 plant.

320

Determinations.

In making stearate of alumina.

1060 To saponify 75 lb. stearic acid use 24543 C C
 Lewis' lye of specific gravity 1,200°.

1064 For Mailing Cylinder Mr. Edison decided to use
 hard rubber shell dipped in Reg Wax.

For veneer Music No. (of
 substitute for hard rubber experiments) for
 base coated with No. 1047.

321

SEPT. 13TH 89.

1065 Mitchels Stearic.....4000 grm.
 Crystals of carbonate.....1200 "
 To duplicate 1059.

1066 No. 1036 100
 Petroleum residue (or wax)..... 10

Idea being to do away with expensive cerasin. 322
 Petroleum wax comes at $\frac{1}{4}$ c per lb. Makes very
 polished cut hard, cohesive, but scratches on
 phonograph.

1067 No. 1036 100
 Petroleum wax..... 20
 Too soft, very polished cut, about 15 to 100.
 No. 1036 will fetch it.

—Redemption of Stearic from Waste Wax having 323
 oleic acid in it—(No. 957).

SEPT. 16/89

1068 Amount of waste wax (No. 957)=500 grm.
 Dissolved in about two gal. water. Precipitated
 by 50 grm. SO_3 =454 grm. of solution of
 H_2SO_4 at 1200° Sp. gv. There was slightly
 too much H_2SO_4 .
 Weight of dried precipitated fats = 475 gram.
 Weight of fat distilled = 428 gram. 324

—Melting points—

1069 Mitchels Stearic acid melts at $131\frac{1}{2}^\circ \text{F}$.
 2nd sample.
 3d sample.
 4th sample.
 5th sample.
 No. 1058 (light colored, not burned) melts at
 236°F .

325

—Miscellaneous Experiments—

1072 Carnauba is distilled in vacuum.

A—The part which came over first white with tinge of yellow, very much softer than carnauba but harder than bees wax.

B—Second sample from No. 1072, about the same as (A).

C—Third sample, about same as A.

D—Fourth sample, little lighter and harder than (C).

326

No. 1073 No. 1059 made in phonograph Works in Large kettle (nickel) came out O. K. And on test the cylinders were found to talk even better than others not any crackles, which I think were due to acetic acid in old process.

MUSIC CYLINDER BASE.

327

1074 No. 121 of book No. 569 molded in screw press, in mold fitted with piston, the material is first made and then placed in the mold, the whole heated to about 250° F. and pressed while hot.

BASE FOR REG. & MUSIC CYLINDER MOLDING—OF WAX
OVER BASE ALREADY MADE.

328

1075 The cylinder is fitted on to a hollow core having water hose connected so as to keep it cool placed in a jacketed mold which is kept warm. Wax poured as usual.

1076 Molded in same mold as in No. 1075, this is cooled this time after the wax is poured, the core was a regular one not cooled.

OCT. 24TH, 1889.

1077 No. 1074 dipped in regular wax, came out bad, had air bubbles in which came from the compound in the subcylinder. Could not dip over $\frac{3}{8}$ thickness of wax.

329

1078 No. 1074 cylinder has a cylinder of reg wax which has been dipped on a mandrel the same size as the outside of the cylinder slipped over it while the wax cylinder is yet plastic. Works splendid, makes a fine cylinder and they could be made with $\frac{1}{8}$ " thickness of wax.

1079 The mandrel for dipping cylinders to be shrunk on subcylinders should be 2" diam. straight 330
i.e. no taper, & 5 in. long, and should be dipped for one minute in wax at 280° F. The machine for dipping should run at about 44 revolutions per min.

1080 The subcylinders is coated (dipped) in paraffine 100 rosin 100 carnauba 5 to make the outside shell stick better, and not crack.

1081 Ozokerite ----- 100 331
Bees wax ----- 100
Dipped on paper.

Flexible but gums on knife, does not indent very good.

1082 H - O e ----- 175
- n ----- 100
- r ----- 30
H O A ----- 20
A - e a - l ----- 600 332
E - - ----- 300
Al - l ----- 300

1083 No. 1082 dipped on regular cylinder previously turned off, no good, warty and rough, wax surface spoiled.

1084 No. 1082 dipped on brass sleeve (polished) very good, good talk, some scratch, flexible when torn off could not be removed whole even when heated.

333

1085 No. 1082 poured inside of a glass bottle of proper taper, this is made to revolve throwing stuff in thin film all over inside of bottle, air is passed in to dry.

(Note on page opposite experiments Nos. 1086 to 1090 inclusive).

Bang up, made fine collapseable cylinder, does not crack when bent double.

334

1086 No. 1082 dipped on regular cylinder, coated with paraffine, no good, paraffine attacked.

1087 No. 1082 poured on glass plate and intended to be cut in stripes, width of cylinder and the end overlapped, while on a standard form.

1088 No. 1082 dipped on brass sleeve coated with silicate soda.

335

1089 No. 1082 dipped on wax cylinder coated with silicate soda.

1090 Sheet hard rubber 5/1000 thick is dipped in regular wax at 370°F. After dipping, made into cylinder with two halves hinged together.

(Three notes opposite experiments Nos. 1100, 1101 and 1102 respectively.)

336

Did not crack.

Cracked very bad.

Cracked bad.

Cold test on wax cylinders.

1100 Soft fussy thread, small size, lineing in regular wax, dipped double, cold by solid carbonic acid (-108°F) 4 of these were tried, all came good.

337

1101 Same condition as 1100, except larger size cord was used.

1102 Same conditions, larger size cord coated with bolata gum.

USEFUL DATA.

By experiment, the stearate of alumina used in the manufacture of wax was found to contain 8.755% Al_2O_3 . Hence, in making the wax, where 17 lb. of stearate of alumina are used to 100 lbs. of stearic acid, 1.4875 lbs. of Al_2O_3 added to 115½ lb. stearic acid would make wax containing same proportion of Al_2O_3 . Or in other figures the proportions for making a charge of wax would be

Stearic acid.....	100 lbs. ($\text{C}_{18}\text{H}_{36}\text{O}_2$)	
Crystal carbonate soda.....	29.5 lbs. ($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$)	
Anhydrous oxide of alumina.....	1.288 lb. (Al_2O_3)	339
Cerasin.....	20.2 "	

With aluminate of soda, the formula would be

Stearic acid.....	($\text{C}_{18}\text{H}_{36}\text{O}_2$).....	100 lbs.
Crystal Carbonate soda.....	($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$)..	18.5 "
Aluminate soda.....	($\text{Al}_2\text{O}_3 \cdot \text{Na}_2\text{O}$)....	3.618 lb.
Cerasin.....		20.2 lb.

340

341

**"Defendant's Exhibit, Aylsworth Note-
Book No. 1000."**

No. 1

PHONOGRAPH WAX.

USEFUL DETERMINATIONS.

342

Amount of Lewis' lye in 100 C. C. of solution of 1,340
sp. gv. at 78°F. = 43.100 gm.

Lewis' lye solution having a sp. gv. of 1,200 contains
100 gm. dry lye in 425 C C of solution.

No. 2

Amount of Lewis' Lye required to make neutral stea-
rate of soda.

343 Stearic acid 100 gm.
Soda 17 "
(Anhydrous caustic soda) (12.5)

Al_2O_3 in stearite of Al (by expt) = 1.115 to 10 gm.
= 5.9 % Al.

Amount Al_2O_3 in standard solution :

Na HO 100 gm.
 Al_2O_3 7.0584 gm.

344 Amount Acetate Al in Standard Solution

NaHO 100 gm.
 Al_2O_3 + (Acetic acid) 40.8 "

Amt. Try hydrate in Standard Solution.

NaHo 100 gm.
 $\text{Al}_2\text{H}_6\text{O}_6$ 10.766 gm.
Stearic 1275 gm.
Soda 100 gm.
Acetate 40.8 gm.
Try hydrate 10.766 "
 Al_2O_3 7.0584 "

345

Stearate (wet way with nutral soda salt,) with alum.

The per cent of Na_2O in nutral stearate of Soda = 12.7.

By calculation it will take 57.15 grams of crystalized carbonate of soda ($\text{NaCO}_3 \cdot 10\text{H}_2\text{O}$) to 100 grams of stearic acid to make nutral stearate of soda.

By experiment it will take 57.14

Amount of stearic acid used	50 grams	346
" of solution of $\text{NaOCO}_2 \cdot 10\text{Aq}$ of		
1.0748	178C. C. M.	

Per cent of $\text{NaOCO}_2 \cdot 10\text{Aq}$ in solution of 1.0748 = 19

11.2 lb. of solution of carbonate of soda at 1.0953 Sp.

Gv. = 420 C. C. and contains 1 lb. anhydrous soda.

Nutral Stearate soda =

Stearic acid	100
Anhydrous Soda	14.5

347

RECOVERING STEARIC ACID AND CERASIN FROM WASTE REG. WAX.

1000 gram. wax are boiled in water until whole is dis-
entergrated, then it is precipitated by sulphuric acid,
washed and boiled out, this leaves 940 gram. 270 gram.
of the 940 are distilled in vacuum of 26 inches, began to
come over when tem. reached 540° F and come pretty
steady at that heat, then the heat gradually
increased until it got beyond the measure-
ment of a 600° thermometer 249 — Dis-
tilled over as a solid white, distillate clear
as water when melted. Out of the 100 lb. of reg wax,
91.7 lb. can be recovered, or there is a loss of 8.3, say
9 lb. per 100 of wax.

348

No. 2.

Stearic	1678 gram.
Soda	131.9 "

or 306 C. C. of 1340 Sp. gv. at 78° F.

349

Stearate Al (wet way, from nutral soda salt)

(a) No. 2—100 gm. Non crystalline—fair.

St. Al. 25 “

(e) No. 2—10

St. Al. 1 (Slightly crystalline in small spots,
good).

(b) No. 2..... 100 gm. Non crystalline.

Stearate Al. 20 better than (a).

(c) No. 2..... 10 gm. Non crystalline.

350 Stearate Al. $2\frac{8}{10}$ chippy.

(d) No. 2..... 10 gm. Non crystalline.

St. Al..... $1\frac{1}{2}$ “ fair.

No. 3.

Stearate..... 1000 gm.

Soda..... 76

Or Soda..... 16 Solution at 1,340 sp. gv. 162 cubic
centimeters.

(a)

351 No. 3..... 100

Stearate Al..... $2\frac{1}{2}$

(b)

No. 3..... 100

Stearate Al..... 5

(c)

No. 3..... 100

Stearate Al..... $7\frac{1}{2}$

(d)

No. 3..... 100

352 Stearate Al..... 10

No. $3\frac{1}{2}$.

May 30, 1889.

1022

FIRST CLASS CYLINDER.

*Not $\frac{1}{2}$ scratch of Reg—make splendid musical cyldr—
very hard—will probably require saphire cutters, can't
be filtered well—moulds nicely—only keenest edges on
Recorder can be used on account hardness—can track*

353

deep—works well as a thick or thin veneer. Low melting point, pours low temperature. The cylinder I tried was filtered—

500 grammes Purified Cake Beeswax.

400 grammes Carnauba.

30 grammes dry salt, acetate alumina.

Cook well to get off acetic, color light brick red—
There is a great lot of precipitated alumina left and this causes filter to work bad.

354

No. 4.

Stearic acid (Very hard and pure, from R. G. Mitchell & Co. N. Y. 5000 grm.

Standard solution..... 1105

Made in brass kettle to determine whether or not brass or copper caldrons can be used for manufacturing wax. When stearic acid was first melted in kettle, it became greenish, and after putting in chemicals, it formed verdigres around the top, from the acetic acid given off. By suspending bright iron in while making, the copper was precipitated on the iron probably from the acetate of copper formed.

355

No. 5. 1023.

Carnauba.....	500 }	
Stearate Al.....	100 }	100
Cerasin.....		20

Talks very good, noiseless, smooth, hard, insoluble, loud talking, and in fact perfect except that shavings do not go through the chip box.

356

No. 6. 1031.

Stearic Acid (Mitchells).....	500	
Lewis lye.....	40	
A—No. 6.....	100	1032
St. Al.	10	
B—No. 6.....	100	1033
St. Al.	15	

357

No. 7. 1034.

Stearic Acid (Mitchells).....	400	
Lewis Lye.....	36	
A—No. 7.....	100	1035
Stearate Al.	10	
B—No. 7.....	100	1036
Stearate Al.	15	

358

No. 8. 1037.

Stearic acid (Mitchells).....	400	
Lewis Lye.....	40	
A—No. 8.....	100	1038
Stearate Al.	10	
B—No. 8.....	100	1039
Stearate Al.	15	

No. 9. 1040.

359

Stearic Acid (Mitchells).....	500	
Lewis lye.....	35	
A—No. 9.....	100	
Stearate Al.	10	
B—No. 9.....	100	
Stearate Al.	15	

No. 10. 1030.

360

Stearate Alumina.		
Mitchells pure Stearic Acid.....	10000	gram.
Lewis Lye.....	1700	

No. 11. 1043.

No. 7.....	100	
Stearate Al.....	15	
Cerasin.....	5	

361

No. 12. 1044.

No. 7	100
Stearate Al.	15
Paraffine	5

Excepted as regular, is an exact duplicate of regular made with acetate solution.

No. 13. 1045.

No. 7	100
Stearate Al.	15
White wax	5

362

No. 14 1046

No. 7	100
Stearate Al	15
Cerasin	30

No. 15 1047

363

No. 7	100
Stearate Al.	15
Cerasin	20

No. 15½ 1048

Mitchel's Stearic acid	100
C. P. NaHO.	9
Cerasin	20
Stearate Al	15

364

No. 16 1054

MAILING CYLINDER.

Gun cotton dissolved in eather + alcohol treated with froto chloride tin + *tannic acid*, filtered, dried, redissolved in alcohol + eather + acetate of amyl, with nutral stearate of alumina dissolved in whole, then filtered and dried on sheets, or dipped on paper shells.

365

No. 17

No. 15 $\frac{1}{2}$	100
Boiled Cofabia.....	10

No. 18

No. 15 $\frac{1}{2}$	100
Cofabia Balsam.....	5

366

No. 19

No. 15 $\frac{1}{2}$	100
Rosin.....	5

No. 22 1052

June 13, 1889.

Made for veneer cylinders for Wangeman to take to
367 Europe. Strained through heavy filter cloth.

10395 gm. beeswax

8316 " carnauba wax

Dry acetate alumina 831 gm.

The latter is added in small lots and well stirred.

Temperature not exceeding 500° F.

No. 23

Thick solution of guncotton in alcohol & ether treated
368 with small per cent. of equal parts proto chloride tin
and powdered of gum euphorbrium.

No. 24—No. 23 with small amount of stearate Al
added to solution.

No. 25—No. 23 with little reg wax dissolved in it.

No. 26— { No. 25 with more reg wax and very small
 amount castor oil.
 b—same heated.

No. 23 $\frac{1}{2}$.*Aug. 14, 1889.*

Stearic acid 500 gm.
 Crystallized carbonate of soda 202.5 gm.

Was too much carbonate—it would not all dissolve
 and made very thick wax.

370

No. 24.

White Wax 100
 Carnauba 70
 Nitrate Al 6

No. 25.

White Wax 100
 Carnauba 80
 Bromide Al 6

371

No. 26.

Stearic Acid 500
 Carbonate Soda (Cryst.) 140

No. 27.

Duplicate of No. 7, using carbonate of soda (crystals)
 in place of Lewis Lye.

372

Crystals are washed and ground, and added to the
 fused stearic. By calculation it takes 30.15 gm. crys-
 talized carbonate to be equivalent to 9 gm. Lewis
 Lye in making 100 gm. of No. 7.

No. 28.

Stearic Acid 4000
 Crystals of NaCO₃ 1100

373

Crystals add while stearic is over 300° F. and are of various sizes, large and small. The crystals work better than the ground mass.

Total amount of wax = 4100.

BEST PHONO WAX.

100 lb. stearic acid (Mitchells).

29.06 lb. crystal NaCO_3 10 aq.

374

17.03 lb. nutral stearate alumina.

10 lb. hard white cerasin.

STEARATE ALUMINA.

200 lb. stearic acid.

65232 C. C. Caustic soda solution of 1,200 gravity at 70° F.

This is dissolved and precipitated by concentrated solution of ammonia or soda alum, well washed and dried.

375

Oct. 17, '95.

Investigation of the cause of black specks in wax and the wax coming dark.

It was observed that the silver lined kettles became black.

376

Tests of the different materials showed that it comes from sulphur in the cerasin. This comes from the natural cerasin, it sometimes is found in nature in contact with a layer of sulphur two or three inches thick. This sulphur is completely removed by heating to 400° with copper turnings.

Improvement in Method of making wax to get rid of the precipitated stearate of Al, which is a source of much dirt and much matter such as sulphate of soda and alum which does not dissolve in the wax.

Tried to dissolve Al in acetic acid.

No go.

Tried to dissolve Al in NaCO_3 + Aq.

377

WAX A LA NEW METHOD.

1035 Crystal carbonate soda 29.08 dissolved in three
1036 times its weight of water; to this is added, after the
solution gets to almost boiling, .28 parts of Aluminum
powder (from Pittsburg Red'n Co.). When this is all
dissolved the solution is filtered hot and quickly.

$\text{Al}_2\text{O}_3 + \text{Aq}$ will separate out. When cold the solu-
tion can now be conc. & then will be ready to put in
the stearic acid.

378

Above is enough for 100 of stearic.

No. 30.

1038 Reg. wax $\frac{1}{4}$ Cerasin.
1039

No. 31

Reg. wax—no cerasin, with benzene.

No. 32.

379

Reg. wax, no cerasin, with linseed oil added.

IMPROVED NEW METHOD OF MAKING WAX.

Oct. 19/95.

No. 33.

25.57 NaCO_3 10Aq. }
1.00 NaHO } Dissolved & heated to
40.00 H_2O } boiling (nearly)

380

.28 fine powd' Al added to above sol.

45 CC of this sol. added to 100 grm. stearic

20.1 grm. cerasin

This will yield 123.7. Sp. Gr. of soda sol. should be
1,200 at 64° F.

When made on large scale (400 lbs.). This wax came
crystalline & some stearate of Al was added which
made O. K.

381

No. 34

Oct. 22/95.

100 stearic
25.5 $\text{NaCO}_3 + 10\text{Aq}$ }
1.0 NaHO }
30 H_2O }
.20 Al. powd.

382 Made in porcelain dish & a strip of lead foil 4" x 6" was emersed with top sticking out, Sol. was added at 240° to 280, when all solution added, tem run to 380° F. and 10 parts cerasin added (pure). Wax foamed off to 440° F when finished allowed to cool in same dish as it was made in.

Skin formed on surface at 324° F.

No. 35.

383

100 stearic
25.5 $\text{NaCO}_3 + 10\text{Aq}$.
1.00 NaHO
30 H_2O
.33 Al powd.

Made same as No. 34, except foamed off for a longer time at 400° — 420°. Cooled in same dish as it was made in.

Skin formed on surface at 330° F.

No. 36.

384

100 Stearic
25.5 $\text{NaCO}_3 + 10\text{Aq}$.
1.00 NaHO
30 H_2O
.40 Al (Powd)

Wax cooked same as No. 34, congealing point 316

No. 37.

Some hard Reg cooled same as No. 34.
Congealing point — 288° F.

No. 38.

Oct. 24/95.

WAX MADE IN LEAD KETTLE AT SILVER LAKE.

400 lb. stearic
 92 " $\text{NaCO}_3(10\text{H}_2\text{O})$
 1359 grm. NaHO
 598 " Al. (powd.)
 120 lb. H_2O
 80 " Cerasin

386

Wax was quite light color but was darkened some
 from burned wax ozeing out of tack holes in lead
 where the seam was made.

Congeaing point— 262°F .

No. 39.

Same as No. 38 taken out before cerasin was added.

No. 40.

HARDENING WAX.

387

700 grm. #39
 14 " linseed oil (boiled?)

No. 41.

HARDENING WAX.

700 grm. #39
 40 " Raw Linseed (heated & filtered)

VARIATION OF REG.

Oct. 25.

388

No. 42.

8 { 100 Stearic
 23 $\text{NaCO}_3 + 10\text{aq.}$
 .75 NaHO
 30 H_2O
 .40 Al. powd. }

No cerasine.

Stearic and Solution were double filtered.

Cooled in the dish it was made—in no crystalline
 spots at all. Very hard wax; good cut.

389

No. 43.

8 {	100	Stearic	}
	23	$\text{NaCO}_3 + 10\text{aq.}$	
	.75	NaHO	
	.50	Al. powd.	
	30	H_2O	
	No cerasin		

Stearic and Solution were double filtered.

390

No. 44.

8 {	100	Stearic	}
	24	$\text{NaCO}_3 + 10\text{aq.}$	
	.75	NaHO	
	.32	Al. powd.	
	No cerasin.		

No. 45.

10/28/95.

391

350 grm. #42
 21 " Thin paraffine oil
 Congealing point—130° C.
 260° F.

HARDENER. No. 46.

350 grm. #42
 28 " Filtered raw linseed

No. 47.

10/29/95.

392

MADE AT SILVER LAKE.

100 Stearic
 23½ $\text{NaCO}_3 + 10\text{Aq.}$
 .75 NaHO
 30 H_2O
 .35 Al.
 20.6 Cerasin

393

No. 47½

11/5/95

MADE AT SILVER LAKE.

100 Stearic
 23 $\text{NaCO}_3 \cdot 10\text{H}_2\text{O}$
 .9 NaHO
 31 H_2O
 35 Al
 21 Cer.

394

No. 48.

10/30/95.

MADE IN AN ALUMINUM KETTLE.

Wt of kettle before—336.75 scant
 “ “ “ after 10 lots—the same.

Stearic acid 100 x 9=900
 $\text{NaCO}_3 \cdot 10 \text{ Aq.}$ 23 x 9=207
 NaHO .75 x 9= 6.75
 H_2O 30 x 9=270
 Al .40 x 9= 3.6

395

No cerasin

Congealing Point—257°F.

No. 49.

Moisture Test.

A lot of different cylinders, among which were some regular and No. 40—41—45 & 46 were put in box heated to 110°F with two lamps in box, over which was a pan containing water soaked waste.

Put cylinders in 9.00 am—10/30/95

No apparent affect at 8.00 am—10/31/95

Graphone cylinder put in 9.00 am—10/31/95

At 8 Am—11/4/95 Regulars unaffected.

No. 41 very dull, No. 42 also dull, No. 45 slightly affected, No. 46 very dull. Graphone not affected.

397

No. 50.

11/4/95.

400 gm. No. 48

60 " Filtered raw linseed

No. 51.

11/4/95.

400 gm. No. 48

32 " Cylinder oil

398 (Note on page opposite Exper. No. 52 and No. 53.)

My conclusion from observation of No. 52 & No. 53 is that aluminum (cast) kettle is O.K. without any doubt.

No. 52.

11/4/95.

TEST OF ALUMINUM KETTLE.

399

100	Stearic	} x 10
23	NaCO ₃ 10Aq.	
1	NaHO (from Merke)	
.40	Al.	
35	H ₂ O	

Started adding solution at 130°C, foamed off to 195° C. Turbidity began to leave at 170°C & when finished it was almost perfectly clear. Very light color. Congeals at 123°C, or 253°F.

400

No. 53.

Same as above made in porcelain dish. The solution was all made together & divided into two equal parts. Made same as No. 52.

Turbidity was noticed about same as No. 52 & left about the same. Very light—congeals at 123½°C or 254.3°F.

No. 54.

350 gm. No. 53 & 52 mixed.

24½ gm. cylinder oil.

401

No. 55.

350 grm. No. 52 & 53.

17½ " cerasin.

14.0 " cylinder oil.

No. 56.

350 grm. No. 52 & 53

73½ " cerasin.

402

No. 57.

350 grm. No. 52 & 53.

28 " vasaline.

No. 58.

Moisture test on Nos. 52, 54, 55, 56 & 57. Put cylinders in box Sat. A. M., box kept at 110°F. till 12, then from 5 to 12 Sat. night, then from 5 P. M. Sunday to 8 A. M. Monday morning. 403

All were affected so that they were not shiny but No. 52 was the least affected.

No. 59.

11/11/95.

Moisture test—No. 52, 54, 55, 56 & 57.

The same cylinders as were used in No. 58 were turned off & put in box again, also No. 1 regular (see No. 38). (has been made about two weeks) No. 2 regular (see No. 47). (has been made about 1 week) No. 3 regular (see No. 47½) (cylinders fresh moulded 11/11/95 A. M. 404

No. 60.

11/11/95.

350 grm. No. 52.

24½ " Rosin oil.

405

No. 70.

11/15/95.

Oil for moulding.
 1300 grm. parafine oil.
 90 " stearate al.
 sented with oil bay.

NEW SOLUTIONS

11/15/95.

406

No. 71.

50 grm. NaHo.
 38 " Al Sheet.
 400 C C H₂O.
 2 parts of fluorisin.

Al dissolved completely—Solution filtered all right.
 Made 325 C C. Did not suparate out after standing
 3 days (or 5 days) 6.5 C C=quantity for 100 stearic.

11/16/95.

407

MANUFACTURE OF STEARIC ACID.

2300 grm. beef tallow—melted down and strained.
 Yeald of pure tallow—2170.
 " " " —94½%.

1000 grm. of above saponified with NaHO, dissolved
 & precipitated with H. C. l.

7%NaHo=130 grm.
 Wt. of fatty acids=994 grm.

408

1200 grm. tallow.

150 " NaHO in 500 C C H₂O, NaHo
 added while tallow is very hot—about 300°F. In order
 to get all NaHo in toward last, temperature allowed to
 fall & 600 C C H₂O added, then precipitated by
 H. C. l.

Fatty acids produced.

No. 75.

11/19/95.

5% chloride sulphur added to Oleic acid cold,
 stirred well, then heated to drive off H. C. l. & when

409

it began to color, saponified with NaHO solution. Result—an oily acid containing both chlorine and sulphur.

No. 76.

11/19/95.

Stearic 1000 grm.
 NaCO₃ 230 "
 Sol. No. 71 65 C C

No. 71 was added when temperature was about 300. 410
 The wax came turbid which did not entirely cool off.

No. 77.

No. 76 molded hot mold cooled with wet rag, care being taken to avoid getting water on cylinder.

No. 78.

No. 76 molded in warm mold, cooled with wet rag— 411
 allowed water to get on cylinder.

No. 79.

No. 76 Molded in very hot shell mold cooled by metal shell, no moisture to speak of on the shell.

No. 80.

11/20/95.

No. 76 100 grm. 412
 Tallow 10 "

Molded in warm mold, care taken to keep wax from water when cooling with wet rag.

No. 81.

Same as above, except cylinder was allowed to get water on inside.

413

No. 82.

Same wax as 80, molded in shell mold with very hot core, cooled with heavy shell ice cold—no water on cylinder.

No. 83.

Same as 80—colored pink.

414

No. 84.

Same as 81—colored pink.

No. 85.

Same as 80—marbelized.

No. 86.

11/20/95.

415

1000 grm. stearic
210 grm. NaCO_3
70 CC No. 71 sol.

No. 71 added while stearic was just melted (about 170–180° F.) was made slowly. Did not become so turbid, but there was slight turbidity even when finished. The wax came pretty crystalline. The yield of wax was 1025 grm, 15 grm. NaCO_3 added—also colored pink salmon.

416

Congeval point—131° C—267° F.

No. 87.

11/22/95.

2170 grm. separated fatty acids.
10 grm. Iodine.

Heated in lead lined sealed iron pipe (5") to 520° F.—took about 3 hrs. to get to heat, then it was held $\frac{1}{2}$ hr. & shut off at noon, heat run up again about 2.30

417

started got to 520 at (Blower shut off temperature 490°)

Sample taken showed that the Iodine had combined with the lead, leaving white iodide of lead in the stuff.

Fatty acid only slightly hardened. Lead vessel will not work.

No. 88.

11/22/95.

Suet tallow melted & mixed with a little benzine— 418
this is allowed to get cold & is squeezed in rag, the residue was melted & cooled off with water to remove the benzine.

Result a much harder substance—no marked crystallization. Hard enough for 20 lb. to the 100 in wax.

No. 89.

11/22/95.

ON TURBIDITY.

500 grm. trifle filtered stearic—minute turbidity in 419
stearic.

115 }
115 } grm. $\text{NaCO}_3 + 10\text{Aq.}$

Foamed off & observed was quite clear after adding the NaCO_3 & foaming off. Perhaps slightly more turbid than the stearic at start. 5 grm. NaHO dissolved filtered & added to the above. Turbidity very perceptibly increased, but in good light the bottom of agate dipper was visible through the dipper full of 420
wax. I would say that this is less turbid than any of the lots of wax previously made.

85 grm. stearate of Al added—turbidity very largely increased, also in foaming off color darkened much.

421

No. 90.

11/22/95.

ON TURBIDITY.

100	stearic	$\times 12 =$	1200
23	NaCO_3 10Aq	$\times 12 =$	276
{	.9 NaHO	$\times 12 =$	10.8
	.38 Al (sheet $\frac{1}{8}$ ")	$\times 12 =$	4.56
	7.2 H_2O (distill)	$\times 12 =$	77
30	H_2O for the carbonate		

422

Wax came pretty turbid. Some was filtered through filter cloth & it came quite clear. The cause of the turbidity is: the Si contained in the aluminum dissolved in the hot soda solution & when the wax is made from this solution the SiO_2 is precipitated. This is not the case when the Aluminum is dissolved in the carbonate of soda solution. Cylinder molded with new mold with freezing mixture.

423

No. 91.

11/25/95.

SOFTENER.

2240 gm. strained tallow has 400 gm. benzine mixed with it while still fluid.

This is allowed to congeal over night in cool place & is then pressed in filter cloth bag under screw pressure—yield of hard stearine—before evaporating 1450 gm.

424

No. 92.

SOFTENER.

Some tallow which was melted down & strained was pressed cold.

Obtained 455 gm. solid.

" 232 " oil.

The solid was remelted and some gum benzoin added to scent it and a little bit of stearate of Al to change the appearance. It was then strained or filtered.

No. 93.

455 grm. No. 90

45 " No. 92.

No. 94.

11/27/95

Oil for Molding

2370 grm. 25° Paraffine Oil

237 " Stearate of Al.

50 " Gum benzoin

200 " Rosin oil (2nd run)

426

Came too thick and ropey. Half was poured out and as much paraffine oil added—then heated and strained.

No. 95.

Oil for Molding

2800 grm. paraffine oil

210 " stearate of al.

80 " benzoin.

427

No. 96.

21/7/95.

Solution

23 $\text{NaCO}_3 10\text{H}_2\text{O}$ x 40 = 920.9 lb. NaHCO_3 x 40 = 36

.40 Al No. 24 sheet x 40 = 16

35 H_2O x 40 = 1400

428

Divided in 2 parts and the Al added to each at 8.45 A.M.

No. 1 Heated—all dissolved at 11.0 c.

No. 2 Cold— " " " (?) was all dissolved Monday morning, 9th.

No. 1 solution had only $1\frac{1}{3}$ as much residue as No. 2. Hence the colder the solution while dissolving, the better. Both lots mixed made 1500 C C. Hence 37.5 C.C. to 100 grm. stearic to make wax.

429

No. 97.

12/10/95.

1600 grm. (?) filtered stearic
 600 C C of No. 96 solution
 Yeald - 1660 grm.

No. 98.

430 Some of the above colored with a little safferine
 analine.

OIL FOR MOLDING.

12/12/95.

6000 grm. 25° Paraffine oil
 380 Stearate of Al.
 150 Benzoin
 150 2nd run rosin oil.

The rosin oil is added after melting and straining.

MANUFACTURE OF STEARIC ACID

431

12/13/95.

200 grms. pressed tallow
 42 " ceresin
 56 " NaHO solution 1.352 Sp. Gr. = 26
 [NaHO]

This lot could be pressed, but not very easily.

TESTING CARBONATE

432 200 grm. NaCO_3Aq , same as has been used in ex-
 periments.

400 H_2O .

Dissolved in a closed bottle. Gravity by weight
 and measure—1128 @ 68°.

NEW LOT OF NaCO_3Aq .200 grm. NaCO_3Aq .400 H_2O .

Gravity by weight & measure 1105

433

10-95.

LOT TESTED.

3/18/96.

200 grm. $\text{NaCO}_3\text{Aq.}$
400 H_2O Sp. Gr. 1142.
Made 525 CC.

No. 99.

12/16/95.

safferine

1400 grm stearic A from Gross of 75 Murray St.
N. Y.—price $8\frac{3}{4}$ c.
525 CC No. 96 Sol.

434

12/95.

No. 100.

500 grm. of No. 99.
75 " of Oleo stearine.

ning.

STEARATE OF Al.

13/95.

Determination of the Al_2O_3 in the regular product
from Silver Lake.

435

100 grm. Stearate gave 11.15 grm. Al_2O_3 .

Gr = 26
[NaHO

MANUFACTURE OF STEARIC ACID.

1/2/96.

200 grm. distilled oleo stearine.
13 " NaHO powder.

sed in ex-

TOBACCO.

1/26/96.
Sunday.

436

by weight

105.

20 grm. KClO_3 .
40 CC H.Cl.
4000 CC $\text{H}_2\text{O.}$

Some No. 35 light color & some No. 32 very dark leaf
put therein.

1105

437

No. 106.

40 gm. KClO_3 .
80 CC KCl .
4000 CC H_2O .

Some No. 35 light color & some No. 32 very dark
leaf put therein.

438

TOBACCO.

2/2/96.

No. 107.

27 gm. KClO_3 .
54 CC HCl .
1800 CC H_2O .

Some No. 32 & No. 35 Tobacco.

439

No. 108.

54 gm. KClO_3 .
108 CC HCl .
1800 CC H_2O .

Some No. 32 & No. 35 Tobacco.

No. 109.

440

108 gm. KClO_3 .
216 CC HCl .
1800 CC H_2O .

Some No. 32 & No. 35 Tobacco.

No. 110.

216 gm. KClO_3 .
400 CC KCl .
1800 CC H_2O .

Some No. 32 & No. 35 tobacco.

TESTING WAX.

3/17/95.

Trouble was experienced in molding. Cylinders come out cracked & stuck to mold.

Congealing point of one of the cylinders—278°F.

Congealing point of the wax from which it was made—264.

2/27/98.

Trouble was experienced at the Phono Wks. with fine pin holes in the cylinders. Only about 25% came O. K. I expected a steam leak into the wax in the melting kettles. Some new wax was tested and the congeal point was 295°. This is higher than should be. It should run 266°–270°. 3% stearic acid brought the congeal point down to 276. Hence 1% stearic acid lowers the congeal point 6°. There was no foaming from the addition of stearic at 370°.

Stear	700 lb. @ 9½	66.50	443
NaCO ₃	203 " @ .90	1.88	
Al	1.9 " @ \$2.00	3.80	
Cer	146 " @ 11½	16.97	
	865	89.10	

Material in new wax	10.3
" " old wax	11.5

3/18/95.

600 lb. stearic	} as made before 19.	444
136 " crystal		
2750 NaHO		
1090 No. 1		

LOT TO BE MADE.

3/19/95.

600 lb.
135 " NaCO₃
2750 " NaHO
1035 grm No. 1
120 lb. cer.

445

**" Defendant's Exhibit, Aylsworth Note-
Book No. 50."**

Try some carbons in linseed oil alone—run gradually as with asphalt, then run it as high as possible.

Ditto—sugar

- 446 " Glycerine
 " Anthracine
 " Carnauba Wax
 " Oil Amber crude
 " Coal Tar
 " Wood Tar
 " Sulphur (flowers) in porcelain dish

**RECORD OF CHEMICALS USED—BEGINNING JAN. 2, 1888.
HARD CUBAN ASPHALT—4 oz.**

- 447 Naptha (Deoderized) 11 oz.
 Oil Mysbane
 Nitric Acid 2 oz.

Turpentine—

- 14 oz—16 oz.
13½
14 oz.
16 oz.

Bisulphite of carbon.

- 448 3 oz.
 3 oz.

Shellac

4 oz.

Oleic acid

2 oz.

2 oz.

Gum Olibarium.

4 oz.

Button Sack.

4½ oz.

			449
Ozokerite.			
4 oz.			
Linseed Oil.			
1 lb.			
Tuno Gum.			
4½ oz.			
3 oz.			
Crude Japan wax.			
8 oz.			
Paraffine.			450
7 oz 2 lb.			
4 oz. ½ "			
Bees Wax.			
2 oz.			
4½ oz.			
Myrtle Wax.			
5 oz.			
Carnauba Wax.			
1 lb.	2 oz.	132 gramme	
12	oz.	132 "	451
1 lb.	2½ oz.	132 "	
11½	oz.	132 "	
		99 "	
14	oz.	33 "	
		132 "	
		132 "	
		132 "	
		66 "	
		10 oz.	
Sesami Oil.			452
3 gram			
7 "			
10 "			
13 "			
16 "			
Oil Hemlock			
3 gram			
7 "			
10 "			

453

Oil Cami

3 gram

7 "

10 "

13 "

13 "

Balsam Tolu.

3 gram

7 "

454

10 "

13 "

Oleic Acid

3 gram

7 "

10 "

13 "

Olive Oil

3 gram

7 "

455

10 "

13 "

Oil Cade.

3 gram

7 "

10 "

13 "

Balsam Cofabia

3

7

456

10

13

Anline Oil

3 gram

7 "

10 "

13 "

Linseed Oil

3 gram

7 "

10 "

13 "

Oil Thyme	
33 grammes.	457
Oil Cassia	
33 gramme.	
Oil Sussinni	
33 grm.	
Oil Juniper Berries	
33 grm.	
Oil Cubebs	
26 grammes	458
Oil Citronell	
7 gramme	
Oil Tansy	
33 gramm	
Oil Organium	
33 grm.	
Oil Tar	
33 grm.	
Oil Ainse	
13 grm.	459
Hydrochloric Acid	
1½ lb.	
½ lb.	
Magan. Peroxide	
125 grm.	
Spermaceti	
3 gram	
7 "	
10 "	
13 "	460
Gum Chicla	
3 grm.	
7 "	
10 "	
13 "	
Gum Camphor	
3	
7	
10	
13	

146

Wood Tar
3 gm.
7
10
13

White Wax
3 gm.
7 "
10 "
13 "

462

Vaseline
3 gm.
7 "
10 "
13 "

Guttapercha
3 gm.
7 "
10 "
13 "

463

Petroleum
3 gm.
7
10
13

Lard Oil
3 gm.
7
10
13

464

Rosin
3 gm.
7
10
13
20

Carnauba
3 lb.
2 "

Gum Thus

3 grm.

7

10

14

20

Cerasin

4 lb.

Japan Wax

3 lb.

Alcohol	lb.	oz.	grm.
	2	6	

Turpentine

Lb. oz. grm.

Eather

Lb. Oz. Grm.

Catchu	lb.	oz.	grm.
			15
			15

Gum Euphorbrium

lb. oz. grm.

15

Gum Gallanum

lb. oz. grm.

Sanguis Dragonis

lb. oz. grm.

15

Benzoin

lb. oz. grm.

Ammoniac

lb. oz. grm.

Gum ammonia

lb. oz. grm.

Gum Amber Chips

lb. oz. gramme.

Zinzibar Fossil Amber

lb. oz. grm.

Bonair Aloes

lb. oz. grm.

465

466

467

468

469

Blood Albumen

lb. oz. grm.

Gum Gidda

lb. oz. grm.

White Glue

lb. oz. grm.

Gum Gattac

lb. oz. grm.

Gum Kani

470

Pulv Sun Arabic

lb. oz. gramme.

Gum Kino

lb. oz. gramme.

Gum Ladanum

lb. oz. grm.

Gum Mastie

lb. oz. gramme.

Mucilage

lb. oz. grm.

471

Myrrh

lb. oz. grm.

Gum Tugacinch

lb. oz. grm.

Gum Olibanum

lb. oz. grm.

Vanilla Gum Benzoin

lb. oz. grm.

Gum Thus

lb. oz. grm.

472

Gum Tacmahac

lb. oz. grm.

Gum Shelac

lb. oz. grm.

White shellac

lb. oz. grm.

Gum Senegal

lb. oz. grm.

Gum Sagaenum

lb. oz. grm.

473

EXPERIMENTS ON A SUBSTITUTE FOR HARD RUBBER.

1.

Hard Mexican asphalt—100, Sulphur 30, mix the sulphur after the asphalt has been melted, then pass chlorine through but do not heat very hot at first, after chlorine has been passed through for some time, heat up to a hot temperature continually passing chlorine through and stirring.

474

2.

Chlorinate the asphalt first, then add sulphur.

50 parts glue, 35 rosin, 15 glycerine, the glue is dissolved in the glycerine by steam and the rosin added for color plumbago.

50 parts glue, 25 of rosin, 25 glycerine, after made melt, add sulphur and chlorine.

50 parts glue, 35 hard mex. asphalt, 15 glycerine, after made and tested, add sulphur and chlorine.

475

Chloride of sulphur dissolved in carbon Bisulphite & naphtha, add linseed oil to the solution, evaporate slowly after they have stood for some time.

Do the same as with the above, only pass chlorine through the solution.

Do same as above but add sulphur to the material obtained.

80 parts Russian glue, 10 ordinary, swell up in 10 parts water, heat in water bath and add 5 parts heavy spar 4 chalk and 1 of boiled linseed oil.

476

Oil hemlock—Carnauba wax

Sesa mo Oil 10, 20, 30, 40

Oil Carni

Balsam Tolu.

Oleic acid

Oil Olive

Oil Amber

Oil Cade

Balsam Fir.

477

Balsam Cafaba
Oil Linseed
Oil Analine
Oil Mace.

EXPERIMENTS—APRIL 20TH, 1888.

Distillation of glycerine at high temperature.

478 Amt of glycerine used.....16 oz.
Amt. distilled over.....oz.
Amt of residue.....oz.
Remarks on products obtained.

March 20/88—COPPER OLEATES—

Amount of sodium oleate used grm.
Amt. of copper acetate used grm.
“ “ “ oleate obtained..... grm.

479

REMARKS.

Copper oleate mixed with carnauba make a hard wax which has great lustre when cut or scraped, and is admirably adopted for the phonograph, but has one fault and only one & that is it is electrical. Copper acetate mixed with glycerine and heated to a high temperature precipitates copper in a finely divided state.

—REMARKS—

480

It makes a good phonograph wax when mixed with carnauba & cerasin in the proportion of 100 carnauba, 40 lead oleate and 30 cerasin.

Oleic acid,	10 oz.		.075
Caustic soda	2 “		.015
Acetate Lead	6 “		.19
25c per lb.			.280

9 lb. 12 oz.
with dish and cover

481

Lead oleate can be made hard or soft in fact it can be made of 50 different constituancys by varying the amt of KHO. The best way to get the desired constituency is to saponify the oleic acid with 1/6 K. O. H. and dissolve the soap in water & alcohol, then add small amts of KOH and try in small amts.

GLYCERINE ASPHALT (APR. 20)

Amount of Glycerine, $10\frac{1}{2}$ lb. 482
 11 of Glyc Asphalt
 Price per lb. cts.

—ETHYLLAMINE— C_2H_7N

Try $C_2H_4O_2$ (Acetic acid) & Ammonia (H_3N)

MAR. 18

Linseed asphalt made in open top pan.

Amount of boiled linseed used..... 9 lb. 483
 1 amount taken out as samples..... 10 oz.
 Amt. of asphalt obtained.....
 Price per lb... ..

OLEATE CHROMIUM.

Precipitated by oleate of sodium from solution of chloride of chromium.

484

OLEATE OF ZINC.

Precipitated from sulphate zinc by boiling solution of oleate of sodium.

COPPER JAPANICATE (so to speak).

Saponify Japan wax with caustic soda dissolve in water and precipitate with acetate of copper.

485

LEAD JAPANICATE.

Stearic acid fused with phosphoric anhydride and treated with Nitric acid. (Watts).

Oleate of Copper.

Amt. of sodium oleate used.....	12 oz.
Amt. of copper acetate used.....	6 oz.
Amt. of copper oleate obtained.....	8 oz.
486 Price per lb.....	20c.

OLEATE OF MERCURY.

Amt. of oleic acid used.....	12 oz.
Amt. of chloride Mercury.....	6 oz.
Amt. of oleat of mercury.....	9 oz.
Price per lb.	

TIN OLEATE.

487 Oleate of potash.....	12 oz.
Chloride Tin.....	6 oz.

ALLUMINAIUM OLEATE.

Precipitated from Oleate of potash by solution of chloride allumina.

Amt. of oleate potash.....	12 oz.
Amt. of Chloride allumina.....	5 oz.
Amt. of Oleate of Allumina.	
488 Amonia alum might do for chloride of aluminaum.	

OLEATE OF BARIUM.

Obtained by precipating oleat of sodium by chloride of barium. It is a stiff flexible mass which can hardly be melted, mixes with waxes; with carnauba it forms a translutant hard waxes, which is very good for the phonograph.

OLEATE OF CALCIUM.

Obtained by precipitating oleate of potash by chloride of calcium. It is very soft and when melted makes a thick translucent liquid.

OLEATE OF STRONTIUM.

Obtained by precipitating oleate of potash by chloride of strontium.

490

OLEATE OF MAGNESIA.

Precipitated from oleate of sodium by chloride of magnesia.

OLEATE OF MANGANESE.

Precipitated from oleate of sodium by sulphate of manganese.

491

Try Gum Bolleta with Carnauba.

Try Gum Bolletta with lead oleate & carnauba for a flexible wax for paper cylinders.

Try arsenic mixed with waxes in small per cents.

Try arsenic trioxide & all the salts of arsenic.

Make arsenic Oleate by precipitating oleate of sodium by arsenic trioxide & other salts.

No. 20.

A solution of oleate of sodium has some sodium bichromate mixed with it which forms a light yellow liquid to this is added a solution of manganese sulphate & a precipitate is formed which is slightly yellow.

492

No. 21.

A solution of sodium oleate precipitates on the addition of a solution of cobalt nitrate, a violet precipitate.

493

No. 23

Oleate of sodium solution has some borax solution added to it which forms no precipitate ; then sulphate of manganese solution is added which forms a white precipitate.

No. 24

494

Acetate of lead solution with 5 grm of the acetate is mixed with a solution of nitrate of silver 1 grm. and this is poured into a solution of sodium oleate a white precipitate is formed which may be oleate of silver and lead.

Chloride of allumina dissolved in KHO precipitates from oleate of sodium a gelatine like mass.

CHLORIDE OF TOLINDIN.

495

Obtained by placing the Tolindin in chlorine gas. Prop. a thick dark sticky mass like wax taffy. Dissolves in water, forming a greenish solution.

No. 88.

496

Oleic residue melted and heated to nearly boiling has acetate of lead solution poured into it ; the lead combines with the oleic acid residue & the solution of acetic acid is precipitated. Discovered by accident. This is a convenient way of making oleate of lead, if oleic acid be substituted for oleic acid residue.

MAGNESIUM SOAP.

Transparent, flexible, harder than lead oleate, great lustre, insoluble in water.

Crude Oleic acid is cooled to a low degree of tem. in a water bath and then strained through two muslin cloths and the part left in the filter is saponified (it should have a sp. gv. of .0880 at 100° F. before saponification. It is saponified by a solution of caustic soda

497

of a sp. gv. of 1.2648 with 200 grm. of the oil or fat I used 130 grms. of the solution. Then I dissolved the soap in 5 gal. of water (boiling) and precipitated the magnesium soap with 165 grms. of magnesium sulphate, the precipitate is well washed in hot and then cold water and placed in an oven heated by steam and dried.

MAGNESIUM SOAP (100).

498

300 grms. of the residue oleic acid (the residue is a different lot than that used in 99) sp. gv. and contains more oleic acid). 50 grm. caustic potash in solution of spv. gv. 1.30 Sulphate of magnesium 210 grm. well washed. Price of the oleic acid by product has to be thrown away—12c. per lb. Amount obtained.

VULCANIZING ASPHALT & LINSEED.

Linseed oil boiled has chlorine gas passed through it until it has reached a sp. grv. of .094. 499

Linseed oil mixture.....	100 parts
Syrian asphalt.....	100 "
Sulphur.....	10 "

This did not make the right constituency. Chlorine was passed through and the temperature was raised very high and about 15 grms. more sulphur added.

No. 2

500

Linseed chlorinated.....	100
Syrian asphalt.....	100
Sulphur.....	30

Linseed chlorine.....	100
Syrian asphalt.....	66
Sulphur.....	30

501

100

Saponify rosin with caustic soda & dissolve in water, then precipitate by hydrochloric acid.

101

502 Melt rosin with castor oil, 100 parts oil, 30 parts rosin, saponify & form a lead salt & magnesium salt of it.

102.

Melt asphalt with rosin, 100 rosin, 50 asphalt, saponify & form lead salt & magnesium soap.

103

503 Melt rosin 100, with castor oil 50, saponify & make lead & mag. soap.

104.

Melt asphalt 100, with oleic acid 30, saponify and form lead and mg. soap.

105.

504 Melt asphalt 100, with oleic acid 50, sp. & form Pb & mg. soap.

106

Melt rosin 100 with oleic acid 30, saponify & form lead and mg. soap.

107.

Melt rosin 100 with oleic acid 50 sp. and form Pb & mg. soaps.

505

108

Melt castor oil 100 & oleic acid 100 together, sp.
and form Pb. & Mg. soap.

109.

Melt Linseed oil 50, oleic acid 100, form Pb and Mg.
soap.

Melt lin. oil 100, oleic acid 100, and form Pb. and
Mg. soap. 506

110

MOLASSES SOAP.

Molasses 100	Lead soap
Calcined soda 28	of this
Oleic acid 100	

Molasses is first heated in vessel large enough to keep
it from boiling over, then the soda is added under con- 507
stant stirring, as soon as the solution is complete 100
parts of oleic acid are carefully added so that the CO₂
escapes first.

Very tough dark brown waxy mass hard & compact.

111

Red Oil	100 grm.
NaOH	25 "

Made in solution and precipitated with a solution 508
of half & half magnesium sulphate & lead acetate.

112

Melt castor oil 100, oleic acid 500, sap make lead &
mag. soap.

113

Same as (112) only form a compound lead & mag.
soap.

509

114

Palm oil 100 & oleic acid 100, make lead & also mag. soap.

115

Palm oil, castor oil, make lead & also mag. soap.

510

116

Palm oil 116, oleic acid, linseed oil, make lead & also mag. soap.

No. 117

Melt rosin 30, with castor oil 100, saponify, dissolve in water & form magnesium salt of this. Light brownish yellow, colored powder, amorphous and hard, hard to melt.

511

No. 118

Red palm oil saponified with $\frac{1}{8}$ percent Lewis Lye; this is dissolved in water and a magnesium salt is precipitated by solution of sulphide of magnesia.

Price of palm oil 23c.

No. 119

512 Stearic acid is saponified by $\frac{1}{8}$ percent Lewis Lye. Lead salt of this is formed by precipitation of the solution of stearate of sodium by a solution of acetate of lead. Price of stearic acid 8c.

Hard, brittle amorphous, solid mass, mixes with cerasin and makes pretty good wax. Melts at about same tem. as carnauba or a little higher.

STEARATE OF LEAD

Stearic 500 grm.
Lewis Lye 165 grm.
Lead acetate.

513

No. 120

Stearic acid saponified by $\frac{1}{8}$ per. Lewis Lye & a magnesium salt made.

No. 120 $\frac{1}{2}$

Stearic 250 grm.
Oleic acid 250 grm.
Lewis Lye 83 "

514

Lead soap of this precipitated by acetate of lead from the solution of sodium soap. Bright cut with about the same or greater lustre than regular (carnaubacerasin), talks better than reg on phonograph, harder than regular wax, melts at very high tem.

No. 120 $\frac{3}{4}$.

Same as No. 120 $\frac{1}{2}$, excepting a magnesium salt is made in place of the lead by using solution of sulphate magnesium in place of the lead acetate. When melted down to solid, it forms a semi-transparent hard, brittle amber colored resin or wax, easily powdered. Has a lustre equal to that of amber when fractured. Mixed with No. 120 $\frac{1}{2}$ in the proportion of 100 grm. No. 120 $\frac{1}{2}$ & 10 grm. 120 $\frac{3}{4}$ it forms an excellent wax better than 120 $\frac{1}{2}$ and gives a fine transparent shaving, cooling surface, perfectly transparent.

515

No. 121.

516

Stearic acid.....	100
Red Oil.....	100
Melted, saponified by $\frac{1}{8}$ per Lewis Lye + lead salt made of	
Stearic acid.....	8c
Red Oil.....	5c
	6 $\frac{1}{2}$ c

No. 122

Lead soap of this from lead acetate.

518

Magnesium soap of this.

Palmitic acid -- 50) lead acetate

519

Palmettic acid. 50 from sulphate man.

520

Oleic acid..... 50 } Magnesium soap.

Spermaceti----- 100 } Lead soap.

Spermatocten----- 100 } Magnesium soap.

165

521

Lead..... 100 { *Lewis lye* 17
 { Lead soap.

Lard 100 { *Lewis lye* 17
Magnesium soap.

522

Stearic acid	100	} Lewis lye 33 Lead soap.
Oleic acid	100	

Stearic acid	100	} lewis' lye 33 Mag. soap
Oleic acid	100	

Oleic acid.....	100	} <i>Lewis Lye</i> 23 523
Stearic acid.....	50	

Oleic acid	100	} <i>Lewis Lye</i> 25
Stearate acid	50	
		} Lead soap

Oleic acid.....	100	} Lewis' lye 25
Stearic acid.....	100	

524

Oleic Acid.....	100	} Lewis lye 25 Mag. soap
Stearic acid.....	100	

Stearic Acid.....	100	} Lewis lye 45. Precipitated by lead acetate 100, mag. acetate 50.
Oleic acid.....	100	
Palmetic acid.....	100	

525

ELAIDIC ACID N 50 BOOK 50

By passing nitrous acid through oleic acid, it is converted into an isomorphic compound called Elaidic acid. Saponify this and make lead soap of it. 455 gm. elaidic acid to 216 C. C. (St solution of lye)

No. 51

526 By passing Nitrous acid through castor oil the recin oleic acid is converted into recin Elaidic acid, light yellow granular solid when crystalized from alcohol, easily saponified and makes a semi-transparent amorphous wax with a very fine polish and nice cut.

No. 52

RECINILIADATE OF LEAD.

527 The castor oil is treated with nitrous acid, washed, melted and saponified. 455 grms of recineliadate to 216 grms. Standard solution of lye (Lewis' lye of sp. gv. 1.270) saponified readily but stayed in, dissolved readily and precipitated with ease.

ELIADATE OF LEAD No. 53

Stearic acid.....	300	gram.
Eliadic acid.....	200	gram.
Saponified 236 C C (St. solution of lye)		

528

No. 54

Stearo Oleate of lead		
Stearic acid.....	300	gram.
Oleic ".....	200	"
Saponified with 235 C C (St. solution of lye)		

529

STEARO PALMATATE OF LEAD

No. 55

Stearic acid 300 gm.
Oleic " 200 "

Saponified with 235 C C (st. solution lye)

This made a light colored translucent hard wax when melted down, and when cast in cylinder, talked very good, cut nice, when a scraping knife was used, slightly fraillable, fine polish.

530

No. 56.

Recinelidate of Magnesium.

Recinelidate (not crystalized from alcohol) 455 gm.

Saponified with 216 C. C. (Standard solution lye)

531

532

533

**Defendant's Exhibit, "Aylsworth Note-
Book No. 533."**

857. *Notes on Experiments Made With Stearate of Soda and Alumina for Phonograph Cylinders.*

No. 1.

534

STEARATE OF SODA.

Made by adding dissolved caustic soda to melted stearic acid. It must be added slowly to the stearic acid, and after adding some, the higher stearate formed is allowed to dissolve up in the stearic acid, more heat being applied as more stearic acid is combined with the soda, as the melting point increases. To 1000 grm. of stearic acid about 100 grm. of NaHO was used. This makes a soap, of a light brown color, with a very high melting point, which when poured out and cooled becomes amorphous on the cooling surface, but crystalline on the inside. It is almost perfection on the phonograph as far as articulation, cut and non-scratch are concerned; but when the cooling surface has been cut through, it becomes crackling and noisy, and when molded it warps and contracts so as to make it impossible to mold. Besides it is soluble in water, though very little.

536

No. 2. 858.

Stearic acid 500.

NaHO.....37	} dissolved together in H ₂ O.
Acetate Al.	
(Sic.).....18	

The object of this experiment is to take the crystallisation out of No. 1, and to make it mold better, which it did admirably, but it also gave it the property of being very electrical. It is not nearly as soluble as No. 1.

537

No. 3. 859.

Stearate of soda No. 1 melted with about $\frac{1}{3}$ Stearate of Mg. (made by adding acetate of Mg. or common precipitated magnesia to fused stearic acid until a transparent amorphous mass is obtained; when sample is cooled on glass or in deep dish it has a slight brownish yellow tint when done). This makes a wax with a very good cut, non electrical, strong good molding, but had to high a melting point to be usefull.

538

No. 4. 860.

Stearic acid.....1000.

Acetate of Barium.....about 100 grm.

The two are fused together. Forms a hard high melting point amorphous solid which has poor cut.

No. 5. 861.

No. 4 mixed with No. 1 in various proportions none of which were as good as No. 2.

539

No. 6. 862.

Stearate of Strontium made same as No. 4, which it much resembled.

No. 7. 963.

Stearate of Strontium mixed with No. 1 in various proportions. Good but not equal to No. 2.

540

No. 8. 864

Stearate of Al.

To fused stearic acid acetate of Al. is added until a white hard, non crystalline cohesive to the cut, wax is obtained. It forms a clear liquid about as thick as melted No. 1.

This molds very good, is insoluble, talks good, cuts

541

good, contracts scarcely any and scratches but a very little more than No. 1, but is very electrical.

No. 9

Stearate of Lead mixed with various proportions of stearate of lead. These were none of them very good, that is they did not equal No. 2.

542

No. 10. 866.

Stearo Sulphurett of Soda.

Made same as No. 1, except hydrosulphurett of soda (NaSO) is used in place of NaHO. This gives a very good wax which is very similar to N 1, in properties if anything it is better and will be good lead in case of any difficulty in the use of No. 2, which for practical purposes is the best for phonograph cylinders.

543

No. 11. 867

Stearic acid.....	12000 gm.
Lewis Lye (Commercial).....	.900 grms.
Acetate Al (Sic).....	433 "

Acetate of Al & Lewis lye are dissolved together in water so as to make a concentrated solution. The stearic acid is melted in iron kettle and heated to 240° F. then the solution is added same as in No. 1, the temperature ranging between 240° F & 380°. This is cooked a day and a half or until bubbles stop coming. This is intended to be made as a duplicate to No. 2, except a little more soda and Al is added. Came out about the same as No. 2, except a little better. Iron of kettle colored it slightly pinkish. This material when cooked at a high tem (400° F) is much improved but is rendered less easily to mold, the melting point increasing also. This wax was all right, except that it chipped out if a very deep cut was

545

made by the phonograph needle. Seems to be too much Al in it.

No. 12. 868

Stearic acid.....2000 grm
Acetate of Al.....72 "
(Not sic)
Lewis lye.....155 "

546

Done same as No. 11 only done in dish pan. This was a slight improvement on No. 11.

No. 13. 869

No. 11 with a little caustic soda & stearic acid added. This is much better and only remains to get the right proportion of stearic acid and caustic soda to make it O.K.

No. 14. 870

547

No. 11 heated up to 500° F or more, somewhat improved.

No. 15. 871

No. 11.....300 grm
Stearic acid.....50 "
Caustic soda.....5 "

548

This is very good in all respects and when filtered is perfection almost.

DUPLICATED No. 15. 872

No. 11.....3000 grm.
Stearic acid.....500 "
Lewis Lye.....50 "

Came out same as No. 15.

549

No. 16. 873

No. 11	500	gram.
Stearic acid	50	"
Caustic Soda	10	"

Very good only little harder to mold and filter than No. 15.

Third duplicate of No. 15, made direct.

550

Stearic acid	14000	gram.
Caustic acid	1100	"
Acetate Al (sic)	433	"

Came out all right same as 15.

4th Duplicate of No. 15, or (No. 34).

Stearic acid	14000	gram. (875)
Caustic soda	1100	"
Acetate of Al	440	"

551

Caustic Soda & acetate of Al dissolved in water same as in No. 11, this is filtered and when measured out equaled 2370 C C of 1,3800 Sp. Gv. at 80°F.

In making the temperature did not exceed 380°F.

After all the solution had been taken up it was kept at about 360 or less for half a day. It took 1½ days to make.

No. 18 (for filtering No. 15) 876

552

No. 15 is melted and heated to 360° F then filtered through common filter paper in oven, filters very slow, about a drop in two seconds or less. Makes perfect cylinder when filtered.

No. 19.

* * * * *

553

No. 20. 877.

Molding third duplicate of No. 15.

The material is melted and heated pretty hot until it gets dark in color. This is then filtered through chinese cloth, and molded in mold heated to 130°F. The mold was not hot enough therefore it left a seam down the length of cylinder, when the wax is first poured in.

554

No. 21. 878

Same as 20 except it is molded in old mold with cold core, and shell heated to 130°F. Shell was wrapped with asbestos paper. This came out fairly good.

No. 22. 879

Tem. of wax.....	329°F.	
" " mold (shell).....	212°F.	
" " " (core).....	212°F.	555

Time left in mold before withdrawing core--22 min.

No. 23. 880

Molding No. 15.

Temperature of wax.....	350°F.	
" of mold (shell).....	212°F.	
" of " (core).....	90°F.	556

Time left in mold before withdrawing--18 minutes.

The wax was poured in fast. This cylinder was better than 22, but left sunken places on outside of cylinder.

No. 24.

Molding No. 15.

Temperature of mold (shell).....	72° F.
" " " (core).....	72° F.
" " wax.....	360° F.

557

Mold is jacketed with asbestos on the outside. Material poured in fast. Stayed in 10 minutes when water was poured on inside of core to cool it so that it could be withdrawn.

No. 25. 882.

Molding No. 15.

558 Temperature of mold (shell)..... 90° F.
 " " " (core)..... 90° F.
 " " wax..... 350° F.

Used the thin core belonging to old mold.

No. 26. 883.

Molding No. 15.

Temperature of mold..... (about 70° F.)
 " " wax..... 350° F.

559 Heavy core wound with thread (Clark's No. 30 Spool cotton).

This molded very good, then was slight seam left on one side, when the stuff was poured in.

No. 27. 884.

Molding No. 15.

560 Temperature of wax..... 350° F.
 " " mold (shell)..... 140° F.
 " " " (core)..... 80° F.

Heavy core wound with Clark's No. 24 spool cotton. Poured in (wax) medium fast. Came out very good except for slight roughness on surface, possibly due to roughness on inner surface of the mold.

No. 28.

Same as No. 27, except inside of mold (shell) is polished and gate is heated to 300° F.

561

No. 29. 886.

Moulding No. 15. (Not filtered).

Temperature of mold (shell).....120° F.
 " " " (core).....78° F.
 " " wax about.....325° F.

Core wound with No. 40 Clarks spool cotton. Inside of shell of mold lined with parchment paper. Came out wrinkled from the warping of the paper, but wrinkles were fine and not very deep. No seam as left on cylinder. Very good. 562

No. 30. 887.

No. 15 (not filtered).

Temperature of mold (shell).....130° F.
 " " " (core).....130° F.
 " " wax.....350° F.

Core wound with No. 40 Clarks spool cotton. Inside of mold lined with writing paper. Came out with less wrinkles, but what there were were very deep and long. 563

No. 31. 888.

Molding No. 15.

Temperature of mold.....100° F.
 " " wax.....325° F.

Cotton thread, wound, core. Inside of mold lined with tissue paper. Wax run on both sides of paper and partially buried it in the cylinder. No good. 564

No. 32.

Moulding No. 15.

Temperature of mold.....(about 60° F.)
 " " core.....190° F.
 " " wax.....360° F.

Cotton thread wound core. Poured in slowly.

565

No. 33. 889.

Filtering No. 15 in the Ott gas burner filtering apparatus.

Temp. of wax in filter..... 350°F.
Amount per hour..... 10½ oz.

Common filter paper.

566

No. 33½

Same as 33. The next hour being taken—filtered considerably less than No. 33.

891.

Large sized cylinders weigh 3 & ¾ oz. just as they come out of the mold. In gm. they weigh 96½ gm.

14000 = 144 cylinders.

567

14000 gm. = 30.9 lb.

892

The best proportions for No. 15 are—To 14000 gm. stearic acid use 2370 C. C. of Standard solution of lye and acetate Al.

Standard solution of lye is Caustic soda

(Lewis)..... 1100 gm.

568

Acetate Alumina..... 440 "

disolved in enough water to make sp. gv. equal 1,3800 at 80°F. after filtering.

No. 35. 893

Cylinder molded same as No. 24, except core is wound with thread and gate to mold is heated to about tem. of wax, then, opened, after filling with wax, letting wax in fast—came out with bubbles in cylinder.

596

No. 36. 894

No. 15 filtered through muslin (twill) fine woven.
Wax heated rather hot, say about 360° in filtering.

No. 37.

Molding No. 36.

Temperature of mold.....	200°F.	
“ “ wax.....	340°F.	570
“ “ gate.....	300°F.	

Core thread wound inside of mold, lubricated with glycerine. After cylinder is cold it is coated on the inside with elastic laquer (gun cotton in amyl acetate) to make the thread stick tight.

Any color may be given the inside of the cylinder by dissolving aniline colors in the laquer.

No. 38. 896.

571

Filtering No. 15 in Otts filter

Tem. of wax 330°F.

Twill muslin used to filter through--amt. per hour
—1 lb. 2½ oz.

No. 39. 897.

Same as No. 38 with a new rag and tem. a little hotter.

Amt. per hour—2 lb. 3 oz.

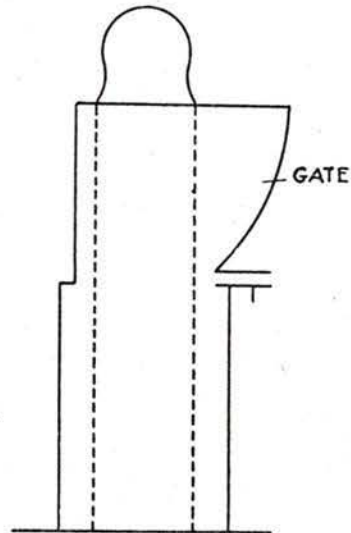
572

573

No. 40. 898.

Molding No. 15 in large gate mold.

574



575

Tem. of wax	240
" " mold	212
" " core	100
" " gate	240

Thread covered core. The gate was filled up with the cut off closed, then the cut off opened and gate filled up again.

576

No. 41. 899.

Same mold as in No. 40.

Temperature of wax	340° F.
" " mold	55° F.
" " core	100° F.
" " gate	240° F.

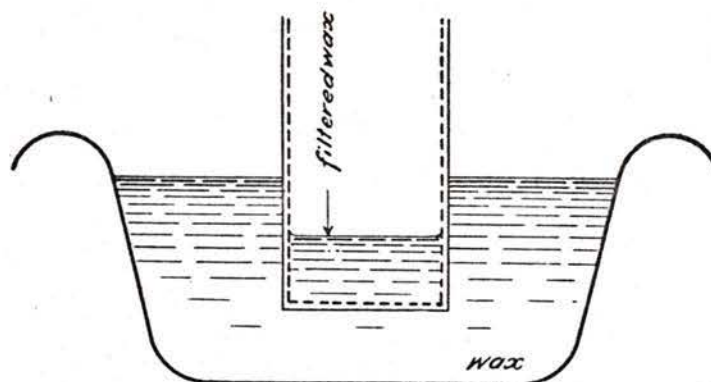
Core thread wound. Gate filled with cut off closed then gate opened and fill again.

No. 41. 911.

577

Filtering No. 15.

A cylinder is made of iron wire sieving about 8 in. diameter and 1½ ft. long, this is covered with muslin (twill) and sunk in molten wax, the top being left open. Following is a view of filter in wax.



578

This arrangement filters very fast, more than 10 lb. to the hour.

579

No. 42.

Molding No. 15.

Old thin cylinder mold was used, it leaving a thin shelled core.

Tem. of mold about 60° F.
 " " wax " 340° F.

580

Poured in medium fast. This cylinder came out perfect. From this experiment it shows that the core and outside mold should be so made that they will cool equally.

No. 43. Molding No. 15.

In mold marked No. 2.

Cold mold.

Tem. of wax about 340° F.

Came out almost perfect.

581

No. 44.

No. 15 with stearic acid added, the former is black in color from continued heating.

Molded in mold numbered 3, with the core belonging to 1, at 360° F. about. Molded all O.K.

No. 45.

582

Molding No. 15.

Molded in No. 2 mold, cold mold (about 60° F.).

Thread wound core.

Tem. of wax 330° F.

No. 46.

Molding No. 46.

583 Molded in No. 2 mold—cold or about 60° F. Thread wound core. Tem. of wax 310° F. Mold jacket with asbestos paper—wax too cold, did not stick to thread; not as good as No. 45.

No. 47.

Molding No. 15.—No. 2 Mold.

Cold Mold (60° about) thread core.

Tem. of wax 350°

Very good—stayed in 10 min. Outside diameter after turning below rough places— $2\frac{3}{16}$ in.

584

No. 48.

Molding No. 15. No 2 Mold.

Mold about 180° F.

Core " 190° F. No thread.

Time in mold—20 min.—Tem. of wax—350°.

Good on outside, except for one little spot, inside fairly good. Diam. after turning below rough places $2\frac{1}{4}$ in.

No. 49.

No. 15.....2 lb. 15 oz.
Stearic acid.....8 oz.

Molded like No. 47. The idea is to see if the stearic acid harms the talking and if it will mold better.

No. 50.

586

Molding No. 15.
Tem. of wax 340° to 350°.
Cold mold. (heavy shell & core mold). Thread wound core. This the right tem. The cylinder came out perfect.

No. 51.

Experiments, to make No. 15 (black) non-electrical.

813

587

No. 15—100 grm.
Balsam (Canada) 5 grm.
Softened it some, but improved the cut. Taking the electrical of 15 as 10, this would be about 6.

No. 52. 814

No. 15.....100 grm.
Canada Balsam.....3 "

Made wax more cohesive and appeared to make it harder very good cut.
Electrical (about 7)

583

No. 53. 915

No. 15.....100
Camphor.....5

No. 54. 816

No. 15.....100
Caramel.....5

589

No. 55.

No. 15.....100
Salicylic acid (amorph)..... 5

No. 56. 918

No. 15.....100
Benzoin acid..... 5

590

No. 57. 919

No. 15.....100
Gallic acid..... 5

No. 58.

No. 15.....100
Pyro. Gallic acid..... 5

591

No. 59.

No. 15.....100
Tannic acid..... 5

No. 60 922

No. 15.....100
Alpha Naphthol..... 5

No. 61

592

No. 15.....100
Silicate Soda..... 5

No. 62

No. 15.....100
Chloride Zinc..... 5

No. 63 925

No. 15.....100
Alum..... 5

593

No. 64

No. 15.....	100
Borax.....	5

No. 65

No. 15.....	100
Venice Turpentine.....	5

No. 66. 929

594

No. 15.....	100
Chloride Ammonium.....	5

No. 67. 931

No. 15.....	100
Tungstate Soda.....	5

No. 68. 930

595

No. 15.....	100
Arcinious acid.....	5

No. 69. 932—page 50.

No. 15.....	100
Molybd acid.....	5

No. 70

596

No. 15.....	100
Zinc Oxide.....	5

No. 71. 934

No. 15.....	100
Chromic oxydat.....	5

Continued on page 70.

597

DEC. 6TH, 1888.

EXPERIMENTS ON PRESERVING RECORDS OF SOUNDS ON
WAX CYLINDERS.

The idea is to coat the cylinder with a thin film that will wear under the influence or action of the stylus (receiver) and handling, atmosphere etc. longer than the cylinder material alone would wear. Such film might be a separate compound as colodion, varnishes, resins, gums, or minerals as sitreate of soda, sitreate of potash, etc. They might be applied in solution with brush or by dipping the solvent afterwards going off and leaving the material as a thin film on the surface of the cylinder. Or the cylinder might be composed of a material such as asphalt compounds and after recording the speech, treated pentichloride of antimony, chloride sulphur, or some vulcanising compound or element.

598

No. 1. 954.

Guncotten applied in solution by means of a camels hair brush to the cylinder. The solvent used was acetate of amyl. It made a good, but very thin film, and did not harm the talk. The cylinder was revolved while putting on the guncotten. There is some difficulty in keeping bubbles from forming in filtering on the guncotten and to get it on uniformly.

600

No. 2.

Solution of guncotten in acetate of amyl, ether and alcohol. The idea of this is to make the film dry quicker. Came out as good as No. 1. and dried quicker. Must be applied quick and not rubbed with brush.

935 No. 72. Page 70

No. 15	-----	100
Talc	-----	5

601

936 No. 73.

No. 15 100
 Fen Chromic 5

No. 74.

Duplicate of 15.

Stearic acid 2500 grm.
 Caustic soda $196\frac{3}{8}$ grm. 602
 Acetate A1 $78\frac{1}{2}$ "

Caustic soda and acetate of A1. mixed together and dissolved in water so that the sp. gv. shall be 1,300 at 86°F. after the solution has been filtered.

This solution = 510 C.C.

937 No. 75.

No. 15 100
 Camphor 24 603

(Note on page opposite Experiment No. 75.)

Considerable softer than No. 15, about as soft as carnauba 100, ceresin 30. Hardens on surface after time.

No. 76.

No. 15 100
 Camphor 5 604

(Note on page opposite Experiment No. 76.)

Very good, non electrical, talks *bang up*, does not chip out just right.

938 No. 77.

No. 15 100
 Camphor 10

605

939 No. 78.

Stearate Soda	100
Camphor	10

(Note on page opposite Experiment No. 78.)
Crystalline.

940 No. 79.

606 No. 74	100
Camphor	5

(Note opposite Experiment No. 79.)

Made to duplicate No. 76, all the way through,
except not heated so much.

Very good, but not quite a duplicate. This was not
electrical, except a very little bit which could hardly be
noticed. It is remarkable that 5% of camphor should
make such a vast difference (No. 74 was frightful

607 electrical).

No. 80.

No. 74	100
Camphor	7

No. 81.

No. 74 heated to 500° F for a short time	100
608 Camphor	5

No. 82.

Stearic acid 3000 grm.
Standard Solution of NaHO & Al (of 1,300 sp.
gv. at 80° F.) 750 C. C.

No. 83.

No. 76 & 80 mixed together, strained through muslin
and molded in cold mold.

609

No. 84.

Stearic acid 2500

Standard Solution of soda & Al (1,300 sp. gv.
at 82° F.) 530 C. C.

No. 85.

No. 84.....	100	
Camphor.....	7	610

941 No. 86.

No. 84.....	100
Cotabia resin.....	7

944 No. 87.

No. 84.....	100	
Mace Oil.....	5	
		611

No. 88. 942

No. 84.....	100
Cofabia.....	5

(Note opposite Experiment No. 88.)
Slightly electrical, but very little scratch.

No. 89. 943

No. 84.....	100	} 100 612
Cofabia.....	5	

(Note opposite Experiment No. 89.)
Very good, non-electrical, scratchless, bang up.

945 No. 90.

No. 84.....	100
Fatty oil Cassie.....	5

613

No. 91.

No. 84.....	100
Oil Cassie.....	5

947 No. 92.

No. 84.....	100
Balsam Sulphur.....	5

614

No. 93.

No. 84.....	100
Tymol.....	5

No. 94.

No. 84.....	100
Red Cedar Oil.....	5

615

950 No. 95 A.

No. 84.....	100
Ccfabia.....	3
Camphor.....	5

No. 95. Same as 95 P.

No. 84.....	100
Cofabia.....	5
Camphor.....	5

616

952 No. 99.

No. 84.....	100
Rosin from Balsam Cofabia.....	5
Camphor.....	5

No. 100. No. 951½

Stearic acid 2000.

Stand. solution of soda & alumina (1,300 at 80° F)
475 cubic cent.

617

952 No. 101

Done in wax room Phonograph Factory—
63425 gm. Stearic acid (140 lb.)
Stand. solution 15063½ C. C.
Good
(Note opposite experiment No. 101)
Took 55 hours from starting to finishing.

No. 102

618

(150 lb.)

Stearic acid.....67815 gm.
Stand. solution.....15065 C. C.

No. 103

(150 lb.)

Stearic Acid.....67815 gm. 619
Stand. solution.....16500 C. C.

(Note opposite Experiment No. 103)
Time started 7:00 A. M. Monday Feb. 3.

No. 104

Stearic Acid.....150 lb.
Stand. Solution.....16145 C C 620

Same ratio as No. 101
(Note opposite Experiment No. 104)
Started 10:30 Feb. 4 P. M.

No. 105.

Stearic acid
Try hydrate Al.
Taking out samples until the non-crystalline point is
reached.

621

No. 107.

Stearic acid	2000	gram.
Red Oil	200	"
Stand. solution	500	C. C.

No. 108 (157)

622 Stearic acid	3000	gram.
Red Oil	150	"
Standard solution	750	"

(Note opposite Experiment No. 108)
Excepted by Mr. Edison as regular

No. 109.

623 Stearic acid (very crystalline)	500	gram.
Spermaceti	150	"
Stand. solution (300—)	170	"

(Note opposite experiment 109)

Crystalline, but gave good cut on cooling surface (little soft) too much solution used. Crystallized very peculiarly when poured in cylinder mold, the following shows a cross-section of cylinder, dark lines indicating amorphous parts & white crystalline. *See sketches at bottom of page.

624

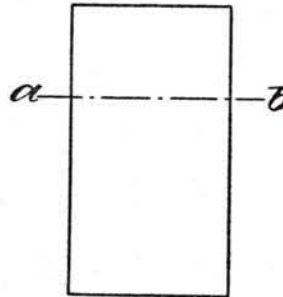
No. 110.

Stearic acid (very crystalline)	500
Linseed oil (boiled)	30
Standard solution (300—)	170

(Note on page opposite Experiment 110)

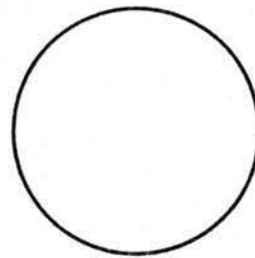
Crystalline, but left a hard amorphous tracing on cooling surface, with an excellent cut. *See sketch next page.

625



Sec. a-b

626



No. 111. 960

627

Regular (hard)..... 100
Spermaceti 12

(Note opposite page with experiment No. 111).

Very good, hard cohesive, not nearly so electrical as regular.

No. 112. 961

Reg. (hard)..... 100 628
Syr. Asphalt..... 10

No. 113.

Reg. (hard)..... 100
Syr. Asphalt..... 5

No. 114.

Reg. (hard)..... 100
Syr. Asphalt..... 20

629

No. 115.

Reg. Hard.....	100
Soft mex Asphalt.....	5

No. 116. 965

Regular (hard).....	100
Soft mex asphalt.....	10

630

No. 117

Reg. (hard).....	100
Soft Mexican Asphalt.....	20

No. 118

Reg. (Hard).....	100
Soft Mex. Asphalt.....	5
Sulphur	$\frac{1}{2}$

631

No. 119 968

Regular (Hard).....	100
---------------------	-----

(Camphoric guncotton, see opposite 5.

(Note opposite Experiment No. 119)

Camphoric guncotton is the product formed by dissolving guncotton in hot melted camphor, think guncotton is decomposed.

632

No. 120

Reg. (hard).....	100
Camphoric guncotton.....	10

No. 121

Reg. (hard).....	100
Linoleic acid.....	$1\frac{1}{2}$

633

No. 122. 971

Camphor melted and boiled with HNO_3 at rather a high temperature until it turns black. HNO_3 is renewed from time to time.

No. 123.

No. 122 has guncotton dissolved in it while melted.

No. 124.

634

Camphor & linseed oil oxidized by nitric acid.

No. 125. 974

Regular (hard) 100
No. 122 10

No. 126

Regular (hard) 100 635
No. 122 5

No. 127. 976

Reg (hard) 100
124 3

No. 128.

Reg (hard) 100 636
123 5

No. 129 978

Reg (hard) 100
123 10

No. 130

Reg (hard) 100
High oleate lead 4

80° F)

637

No. 131

Reg (hard).....	100
Soft Mex Asphalt.....	10
Sulphur.....	$\frac{1}{2}$

No. 132 981

638 Sublimate obtained from boiling camphor with nitric acid with the potash salt of.

No. 134.

Stearate of soda (nutral) in which acetate of amyl has been poured in the hope of making stearate of amyl.

No. 135.

639 Some of solution of No. 134 precipated by lead acetate solution, lead stareate (nutral) I think.

No. 136. 984.

No. 123 dissolved in alcohol for varnish.

No. 137.

No. 122 (higher oxydisation) dissolved in alcohol.

640

No. 138 986.

Stearic acid in fusil oil with H C 1 gas passed through in should be composed in part of stearate of amyl.

No. 139. 987.

Reg. (hard).....	100
Acetate Amyl.....	4

Defendant's Exhibits.

195

641

No. 140.

Reg. (hard)-----100
Acetate amyl-----10

No. 141

Reg (hard)-----100
Pyroxilini (Mores Laquer) in acetate amyl-----5

642

No. 142.

Reg. (hard)-----100
Pyroxilini (Mores laquer) in acetate amyl-----10

No. 143

Reg. (hard)-----100
Sulphide antimony-----5

No. 144 992

643

Reg (hard)-----100
Sulphide antimony-----10

No. 145.

Reg (hard)-----100
Sugar-----10

No. 146.

644

Reg (hard)-----100
Sugar-----5

No. 147.

Reg (hard) 100 Strontium Chromic 5

No. 148.

Reg (hard) 100 Strontium Chromic 10

645

No. 148 (a) 997

Reg (hard) 100 Hydro Sulphurat Rubrium 5

No. 149.

Reg hard 100 Hydro Sulphurat Reubrium 10

No. 150.

646

Reg (hard) 100 Sulphur 1

No. 151

" " 100 Sulphur 2

No. 152

" " 100 Sulphur 5

647

No. 153

" " 100 Sulphur 10

No. 154

" " 100 Sulphur 20

No. 155.

Reg " 100 Sulphur 30

648

No. 156. 1005

Reg 100 Ammonia phosphoric 5

No. 157.

" 100 Ammonia phosphoric 2

No. 158.

Reg 100 Ammonia phosphoric 10

No. 159. 1008

Reg 100 Potassia Sulphuret 2

No. 160.

Reg 100 Potassia Sulphuret 7

No. 161. 1010

Wool is dissolved in K. H. O. solution, 1 part wool 650
to 3 parts K H O and oxidized by 2 parts permanganate
pottash solution decanted, filtered, precipated by lead
acetate.

No. 162

Lead salt of acids obtained by oxydation of wool.

No. 164 1011.

Camphor dissolved in alcoholic potash and oxydized 651
by permongnate pottash.

Determination of amount of Lewis' lye required to
make neutral stearate of soda from hard clear stearic
acid

Stearic acid.....	5 gm.
NaHO	.85 "
or Stearic acid	100 parts
NaHO	17 "

Determination of amt. of solution of alum at 1,050 652
sp. gv. required to precipitate 100 parts stearic acid
Amt stearate aluminum produced—.85 gram = 185
C C with sp. gv. at 1350.

(Note opposite this determination)

Tartarate of Al made direct in evaporating dish
and melting—makes very amorphous transparent wax
to cut, peculiar mass, which changes to crystals and
cracks.

653

No. 165.

STEARATE AL.

Wet way

Stearic acid 500 gm.
Lewis Lye 85 "

Dissolved in water 6000 C C

654 No. C. C. lye at 1,350 sp. gv. =

Amount of alum at 1050 sp gv. = 3250

No. C. C. water to make mix with 85 gm. lye to
make 1,350 sp. gv. = 350.

No. 166.

Stearic acid 100
Lewis lye 7½
or " " solution at sp. gv.—)

655

Stearate Al No. 165) =

656

"Defendant's Exhibit, Comparative Statement."

	Macdonald Patent Formula A	Macdonald Patent Formula B	Aylsworth No. 858	Aylsworth No. 871	Aylsworth No. 957	Aylsworth No. 1046	Aylsworth No. 1058	Useful Data	Aylsworth No. 1000	Aylsworth Patent No. 1029	Storms Formula	Aylsworth No. 1029	Formula used as Basis of Calculation.
Stearic Acid.....	408	408	408	408	408	*408	*408	*408	408	408	408	408	$C_{17}H_{34}O_2$ $\frac{1}{2}$ Stearic $\frac{1}{2}$ Palmetic
Oleic Acid.....	.00	.00	.00	.00	20.4	.00	.00	.00	.00	.00	.00	.00	
Stearate Alumina.....	48.4	40.6	48.3	41.7	45	56.9	56.8	60.	26.7	33.5	33.5	37.5	$Al [C_{17}H_{33}O_2]_2$
Acetate Alumina (Dry)...	15.3	12.9	14.7	12.6	13.7	16.4	16.4	17.6	8.5	10.2	10.2	11.6	$Al_2O_3 \cdot 2 [C_4H_9O_2] \cdot 2H_2O$
Hydrate Alumina.....	7	5.8	6.68	5.7	6.2	7.5	7.5	8.0	3.8	4.6	4.6	5.2	$Al_2O_3 \cdot 3H_2O$
Aluminium Metal (Pow- der).....	2.42	2.04	2.32	2.0	2.16	2.6	2.6	2.78	1.34	1.61	1.61	1.8	
Caustic Soda [Na OH]....	27.2	3.9	30.2	32.0	34.2	31.8	30.1	29.12	3.06	4.08	4.1	32.7	NaOH-100% Pure
Caustic Soda Lye (37.5° B)	85.	12.2	94.4	100	106.9	99.4	94.3	91.	9.5	12.7	12.7	102	37.5 B=1.35 Sp. gr.=32%
Sal Soda [Na ₂ CO ₃ 10H ₂ O]	.00	8.16	.00	.00	.00	.00	106.2	104.2	93.8	87.7	91.8	.00	Na ₂ CO ₃ 10 [H ₂ O]
Na ₂ O.....	21.08	20.2	23.4	24.8	26.5	24.6	23.3	22.5	22.7	22.19	23.9	25.3	
Ceresin or Hydrocarbon.	72	81.6	.00	.00	.00	113.7	113.6	71.3	81.6	87.2	73.4	138	
% Stearic Saponified to form normal sodastearate	44.9	44.1	49.9	52.8	56.5	52.5	49.9	48.1	48.4	47.2	49.2	54	$C_{17}H_{33}NaO_2$
Carnauba.....	.00	.00	.00	.00	.00	.00	.00	.00	.00	87.2	.00	.00	

* This Stearic acid includes that contained in the Stearate of Alumina added as such.
Ingredients actually used are underscored.

660

659

658

657

Defendant's Exhibits.

199

661

"Defendants Exhibit, Statement of Aylsworth Analyses."

662

Cylinder No.	1	2	3	4	5	6	7
Color.....	Dark Choc- olate.	Dark Choc- olate.	Dark Choc- olate.	Light Brown.	Salm- on.	Salm- on.	Black.
Hygroscopic Water	.10	.30	.10	.00	1.30	.20	.05
Total Organic.....	94.16	93.80	94.22	94.80	92.42	93.22	94.85
" Inorganic...	5.74	5.90	5.68	5.20	6.28	6.58	5.10
Stearic and Palm- itic.....	80.26	81.10	80.12	68.76	86.92	88.00	73.31
Oleic Acid.....	3.56	2.98	2.56	1.70	5.50	5.22	2.46
663 Hydro Carbon.....	10.30	9.72	11.54	24.34	.00	.00	18.26
Organic Residue...	.00	.00	.00	.00	.00	.00	.82
Alumina [Al ₂ O ₃]	.96	.96	.82	.78	.78	.88	.86
Iron [Fe ₂ O ₃]	.19	.20	.22	.19	.08	.10	.08
Lead [PbO].....	.13	.12	.12	.07	.00	.00	.00
Soda [Na ₂ O].....	4.50	4.62	4.52	4.16	5.42	5.60	4.16
Copper.....	Trace	Trace	None	None	None	None	None
Calcium and Mag- nesia.....	Trace	Trace	Trace	Trace	Trace	Trace	Trace
Free Fatty Acids...	42.32	41.78	39.68	33.32	53.96	51.84	40.20

664

"Defendant's Exhibit—Aylsworth Aluminum Voucher."

OCT. 25, '95.

EDISON MANUFACTURING COMPANY TO J. W. AYLS-
WORTH, DR.

666

Following Expenses :

Oct. 16	Car fare to & in N. Y.	.50
" "	Lunch at N. Y.	.30
Oct. 19	Car fare to Silverlake	.20
" 22	" " "	.20
" "	Dinner at "	.30
" 24	Car fare and dinner at Silverlake	.50
	Bill of E. & A. paid	7.29
	Memo'm Pittsburg Reduction Co.	1.50 667
		10.79

O. K.

WEG.

Received Payment

J. W. AYLSWORTH.

Alum Bze powder

8 oz. at 3.00 lb. ----- 1.50

BOWLES. 668

669

NEW YORK, Oct. 16, 1895.

J. W. Aylsworth, Orange, N. J., BOUGHT OF EIMER &
AMEND, Importers and Manufacturers of Chemi-
cals and Apparatus for Chemists and Assayers,
205, 207, 209 & 211 Third Ave.

3	Meissen Combustion	
	Tubes 20 x 1" 1.25	
670	25% -----	2.81
	1 lb. Calc. Carbide -----	.40
	1 oz. Barium Carbide -----	.50
	1 oz. Alumin " -----	.60
	12 ft. 1/4" Heavy White Tubing -----	1.20
	1-3/4 oz. Rubber Stoppers -----	.18
		5.69
	1 Steam Thermometer 500° F 2.00-	
	20% -----	1.60
671		\$7.29

Received Payment

Oct.

EIMER & AMEND

Per F. L. DANE.

672

673

**"Defendant's Exhibit, Aylsworth Sheet
Aluminum Voucher."**

PITTSBURGH, PA., Nov. 16, 1895

EDISON MFG. CO.,
ORANGE, N. J.

To the PITTSBURGH REDUCTION Co., Dr.,
Manufacturers of Aluminum by the Hall Process
Branch Office 701 Ferguson Building
323 P
Order No. 7342

674

11 lbs-8 oz No. 1 ingredient at 2.25..... 25.88

Mfg. Wax

Extension O. K. M
Price and } O. K. M
Discount }
Received O. K. DH
Date Received Nov. 18, 1895
Distributed by M

675

For J. W. Aylsworth

PITTSBURGH, PA., Nov. 16, 1895

EDISON MFG. CO.
ORANGE, N. J.

To the PITTSBURGH REDUCTION Co., Dr.
Manufacturers of Aluminum by the Hall Process
Branch Office 701 Ferguson Building
3 2 3 P
Order No. 7342

676

10 lbs 4 oz. No. 2 ingredient at 58c..... 5.95

For J. W. Aylsworth

Mfg. Wax

Extension O. K. M
Price and }
Discount } O. K. M
Received O. K. DH
Date Rec'd Nov. 18, 1895
Distributed by M

677

THE PITTSBURGH REDUCTION CO
Manufacturers of
Aluminum

NEW YORK, Nov. 21, 1895

Received from J. W. Aylsworth c/o Edison Mfg. Co.,
Orange, N. J.

Twenty Two ----- $\frac{75}{100}$ Dollars

678

In Payment of 10 lbs of No. 1 Ingredient

at $2.\frac{25}{100}$ 22.50
Boxing, etc .25

----- 22.75

O. K. JWA

679

Extension O. K. M
Price and
Discount O. K. M
Received O. K. D. H.
Date Rec'd Nov. 25, 1895
Distributed by

Mfg. Wax

680

**" Defendant's Exhibit ", " Miller Note
Book."**

4200 St

886 Cear.

Aluminate of Soda

635 cc of H_2O & 100 gr. of Alum. Soda--1 gr = $\frac{1}{100}$ of 635 cc = 6.35 cc Specific Grav. 1100 at 90 deg.
Far.

682

Formulæ for Wax

Stearic 100	} To find No. of cc of A. S. solution for batch of 100 lbs. of stearic acid
Soda..... 18.5	
Soda Alum. 3.61	
Cear 20... 24 $\frac{1}{2}$	
	3.61 x 453 No. gr. in alloy = 1635
	gr. x 6.35 cc which contains one gr.
	of A. S. = 10382. cc to 100 of
	Stearic.

TEMPERATURE TEST.

Specific Gav.	Temp.
1090	140
1092	130
1094	120
1096	110
1098	100
1100	90
1102	80

Formulæ on Page 9

THE MAKING OF STEARATE OF ALUMINUM.

684

Dissolve in tank on roof so as to make a saturate solution allum with water after which filter in tank below. Then fill jacketed kettle with stearic acid after melting add solution caustic soda and stir up well, then shovel in tank No. 2 on platform and tank half full of water, boil same until dissolved.

Then fill tank No. 3 on floor with one foot deep of this solution & let filtered allum solution run in until a peculiar crumbly condition, the solution (stearic acid

685

& caustic soda) to be very hot when allum is run in. It is then run in trough No. 4 and strained and washed four times by turning hose on and stirring, then allow water to drain off thoroughly and put in press and squeezed, then put in pans to dry in oven for two days or more, the longer the better.

MAKING OF POWDER.

686 Take 200 lbs of stearic acid melt, and with constant stirring add 65,232 cc of caustic soda solution of 1200 gravity at 70 deg. F. (3700 cc to a gallon of water) 18

This will make about 200 lbs of powder as the amount gained by the reaction is lost in washing and working.

65232 cc = 17 gal. + 2332 cc

THE MANUFACTURE OF WAX.

687 Melt Stearic Acid with slow or slight heat and filter through bags of fine filter cloth, then heat to 350 deg. F then add pure carbonate of soda crystals, little by little, at the same time raise the temperature, after this mixture is thoroughly foamed off add Powder, after this is foamed off *strain through* 4 or 5 thicknesses of fine muslin *add cearsin.

ASHINGTON'S FORMULA.

100 Stearic Acid
688 29.06 Soda
17.03 Powder 14.3% of whole

146.09 Total
27.09 loss due to escape $H_2O + CO_2$

119 lbs & Stearic vapors

Add to every 100 lbs stearic acid 6.25 lbs cearsin to make 5% wax

Add to every 100 lbs stearic acid $16\frac{1}{4}$ lbs to make 12% wax.

689

POINTERS.

The smallest that can be made in one kettle is 400 lbs of Stearic Acid or it will blacken at the sides if less.

600 lbs is the most of Stearic can be made at a time or soda will foam over.

To make wax raise stearic to 300 deg. F., add NaCO_3 (soda) little by little, until nearly $\frac{1}{2}$ is in, then raise heat to 350 deg. F & work in more then to 380 deg F, and work in remainder, after it has foamed off add powder raise to 430 deg. F, and keep there until foaming ceases, then add cearsin after this is well dissolve, after which filter at 450 deg. F. through five thickness of Muslin.

1			
Stearic	-----	100	gr
Soda	-----	18.5	"
Soda Aluminate*	-----	3.618	gr.
Cearsin	-----	20.2	"
			691

or 22.9 cc in solution ss. 1100 at 90 deg. F

No.=10832 cc of solution of 1100 grav. at 90 F. to 100 lbs stearic.

10382

2

20764

POINTERS.

692

Stearic acid to be used is Michell's filtered, or Proctor & Gamble. Soda the regular commercial.

STANDARD SOL.

If it takes 20 cc to neutralize 2 gr. of stearic, 1 cc to neutralize $\frac{1}{20}$ of 2 gr=.1 of a 2 gram of stearic.

If sample to be analyzed it takes 27 cc to neutralize same $27 \times .05814$ (standard sol)=1.569 Stearic in 2 gr.

11 gre=1.569÷2=.784×100 to get %=78.4%

100-78.4=Cear contained Sol. .073394

693

FORMULAS.

12 Percent Wax.

400	Stearic Acid	
116 $\frac{1}{4}$	Soda	108 $\frac{1}{4}$ loss
68	Powder	
65	Cearsin	

5 Percent Wax.

400	Stearic	
116 $\frac{1}{4}$	Soda	
68	Powder	
25	Cearsin	

5 Percent Wax.

600	Stearic	
174 $\frac{1}{4}$	Soda	163 $\frac{1}{2}$ loss
102	Powder	
37 $\frac{1}{2}$	Cearsin	

695

5 Percent Wax.

500	Stearic	
145 $\frac{1}{4}$	Soda	
85 $\frac{1}{4}$	Powder	
81 $\frac{1}{4}$	Cearsin	

Duplicating Wax.

Beeswax	500 pt
Carnauba	400 "
Accatate of Alluminum	40 "

696

To make duplicating wax add beeswax & carnauba together* and add little by little accatate of alluminum, cook with low heat but several hours until a fair red color.

*Cook for 12 hr. at 300 deg.

ANALYZING STEARIC.

Weigh out two grams of material to be analyzed very accurately, then add 200 cubic cc of commercial

697

alcohol then add 6 drops of Phenolphthalein in alcohol ethyl (1 gr. to 100 cc of alcohol), then heat to boiling point to dissolve same, next fill buret with very dilute caustic soda, specific gravity 1.015, and pour solution already made until it turns a red color.

New Wax.

Stearic	20 1/4	pt	
Soda Bica	6	"	
Carnauba	57	"	698

Resinate of Soda

115 Water

6 Caustic Soda

25% of solution

64 Rosin added gradually

110 water

The added 25% soda solution deducted very slowly.

Hard Wax Black.

699

250 pt. Carnauba by wg.

1 pt. Caustic Soda

175 pt. Syrian Asphalts

Page 17

RECOVERING WAX.

Put wax in tank, boil until all dissolved, then add 55 lbs H_2SO_4 to 500 lbs of Wax then boil well, float on water and strain into pans. 700

1000 of wax recovered=1010 lbs.

1010 lbs. recovered... = 545

distilled wax.....11.6%

Loss is 23% of stear

100 lbs of wax at 4c=4.00

70 lbs Stearic it contains 2.80

We get 54 Stearic & Cearsin out of 100 lbs wax

701

TO HEAT UP KETTLES.

2240 1 Ton Coal

COAL.

Burn about 2000 per day, with super heater & furnace 1900 actually.

702

48 hard Reg. without cearsin

16 Carnauba

8 Cearsin

PERCENT.

Stearic	70%
Cearsin	17%
Powder	11.9
1.1% Soda	

703

RECOVER COSTS.

1000 lbs = ...	1000 lbs recovered
1000 " distilled = ...	545 lbs wax

Material Used

110 lbs Sulphuric	1.26
800 lbs Boiling Tank	
600 " coal superheater 4 days	
800 " " heat kettle 4 days	

704

2200 coal at 1-3.50	3.50
Labor 2 days	3.00

	7.56
H ₂ SO ₄	1.26
	8.82

705

COST OF MANUFACTURING NEW WAX.

2550 lbs per week at 15c.....	382.50	
306 " Pd in above		
Coal & Labor.....	18.00	
2 men labor per week.....	20.00	
Coal per week		
11985 lbs = 6 ton.....	18.00	
	2550)	438.50
		706
		17.2c

Besides distill 1900 per week
Consumes 3500 recovered

AYLSWORTH DISTILL.

P date—

NEW STYLE OF WAX.

600 lbs stearic	707
138 lbs soda	
126 lbs Cear.	
Solution	
23 gals N ₂ O	
2440 grams caustic soda	
952 " Carbide of iron*	
Experiment to cheapen wax use $\frac{1}{2}$ cearsin and $\frac{1}{2}$ filtered tallow.	
*Aluminum.	

708

PROBLEM.

How much of 17% wax must be added to 119 lbs
wax without cearsin to make 12% wax

X = lbs to be added of 17% wax

119 + X = total

.12 (119 + X) = cearsin in whole

.17 X = cearsin in lbs to be added

.12 (119 + X) = .17 X

.05 X = 14.28

X = 285 $\frac{3}{4}$ lbs

709

PRICE OF MATERIAL.

	Per lb
Reg. Phono Wax, 12%.....	.20
“ “ “ 5%.....	.20
Duplicating Wax.....	.50
Powder.....	.17
Lubricating Sticks.....	.1 ⁶ / ₁₀
Waste Wax No. 1 & 2.....	.15 & .13
“ “ No. 3 too much.....	.06
710 Half recovered.....	.07
Soda Carbonate.....	.0125
Residue of distilling.....	.06
Waste White Wax.....	.02
Stearic Acid recovered.....	.11
Sulphuric Acid.....	.0125
Cearsin.....	.15
Allum.....	.0180
Caustic.....	.0450
Beeswax.....	.40
711 Shellac.....	.18
Sulphur Rolls.....	.02
Caruauba.....	.09
Acetate of All.....	.40
Muslin.....	.26
Canvas.....	.55
Zinc Oxide.....	.03

LATEST PRICES.

712 Stearic.....	.13
Cearsin.....	.14 ¹ / ₂
Soda.....	.01 ³ / ₄
Alum.....	.01 ³ / ₄
Powder.....	

ESTIMATE ON POWDER.

200 lbs St.....	2 hours to melt
32 lbs caustic.....	1 hr to boil
133 lbs alum makes 210 lbs	
2 days work, 2 men, 2 days drying	

Defendant's Exhibits.

213

			713
200 st.	= 26.00 at	13c	
30 caustic	= 13.50 at	4½	
133 alum	= 2.32 at	1¾	
2 ton coal	6.00		
Labor	6.00		
210) 41.67 (20c			
420			

Powder 20c per lb.

714

At above prices material raw cost 14¾c

Coal and labor cost 2c per lb at the rate of 1760 lbs per week not counting 50% extra of scrap added to most batches which 6c per lb is made for filtering at the same time 600 lbs of stearic is distilled

COST OF MATERIAL ALONE.

Stearic.....	78.00	600 st	715
Soda.....	3.06	175 sd	
Cear.....	21.90	146 lbs	
Powder.....	{ 26	200 st.	
	{ 1.35	30 C. S.	
	{ 2.32	133 Alum	
850) 122.63			
14.5c cost			

Refer to middle of book 25

Shaving.....	.04	716
Wax selling price.....	.21½	
To wax complete.....	2½c	
Wax without powder.....	1¾	
distill.....	20	

717

**"Defendant's Exhibit," "Aylsworth-Miller
Note No. 1"**

J. W. AYLSWORTH,
48 Germania Avenue,

MARION, N. J. 189.

718 *The proportions of materials for making wax are*

100	lbs....Stearic Acid.....	400	lbs
29.06	lbs....Crystalized Carbonate Soda..	116.24	"
17.03	lbs....Powder (Stearate of alumina)..	68.12	"
		584.36	
146.09		108.36	
		476.	

719 27.09 lb. loss due to escape of H₂
O+CO₂ & Stearic vapor.

119.00 lb. good wax containg no cerasin
340.00 lb. filtered scrap containing 25 lbs cearsin to
every 100 lbs stearic acid (or 17.9%)
459 lbs....good wax containing 17 lb. cerasin to
every 100 lbs stearic acid (or 12.8%)

16½ cearsin for New Batch to every 100 of stearic
720 acid for 12% wax

Formular for 5% cearsin wax 6.25 lb to every 100
stearic acid

Note on back of sheet: Try this—

Carnaba 500 grams
Stearate of All 100 "

Mixed together, heated for some time.
100 parts of Above add 20 pts cearsin

-Miller

**"Defendant's Exhibit, Aylsworth-Miller
Note No. 2."**

J. W. Aylsworth
48 Germania Avenue,

MARION, N. J.-----189

POINTERS

722

The *smallest charge* that can be made in one kettle
is 400 lbs stearic acid.

*If less quantity is made it will blacken at top or sides
of kettle.*

500 lbs is good charge when no waste wax is to be
worked in.

Not more than 500 lbs or kettle will foam over in
making.

TO MAKE KETTLE OF WAX

723

Take 400 lbs pure stearic acid (Mitchells') filtered.
Heat to 300 deg. F.

Add crystal Na CO_3 little by little until nearly $\frac{1}{2}$ are
worked in; then raise heat to 350 deg. and work more
then to 380 and work in remainder add 68.12 lbs
powder

Heat to 430 deg. and keep there until foaming ceases.
Bail off 230 lbs of this wax and reserve.

To remainder add 680 lbs filtered scrap. Raise
heat to 400 deg. and filter through muslin then pour
into pans to cool.

724

216

Defendant's Exhibits.

725

**"Defendant's Exhibit, Aylsworth-Miller
Note No. 3."**

726

J. W. Aylsworth
48 Germania Avenue,

MARION, N. J. 189

FOR MAKING STEARATE OF ALUMINA

Take 200 lb stearic acid melt and with constant stirring add 65232 cc of caustic soda solution of 1,200 gravity at 70 deg. F.

727

This will make about 200 lbs of powder stearate of alumina as the amount gained by the reaction is lost in washing and working.

728

Per lb
 .20
 .20
 .50
 .17
 .1⁶/₁₀
 .15 & .13
 .06
 .07
 .0125
 .06
 .02
 .11
 .0125
 .15
 .0180
 .0450
 .40
 .18
 .02
 .09
 .40
 .26
 .55
 .03

**"Defendants Exhibit, Wax Voucher
 April 1894"**

April 18, 1894 730

EDISON PHONO WKS
 Orange, N. J.

Dr. to EDISON MANUFACTURING Co. 110 East 23rd
 Street, New York. Orange, N. J.

2082 lbs Phonograph Wax at 21-1/4 c lb----- 442.43
 O.K.

GBR 731
 Send checks, money & Letters
 regarding accounts to Orange, N. J.

732

..... .13
14¹/₂
01³/₄
01³/₄

ers to melt
 o boil

218

Defendant's Exhibits.

733

**" Defendants Exhibit. Aluminum Voucher
June 1896 "**

PITTSBURGH, PA., June 15, 1896

EDISON PHONOGRAPH WORKS
Orange, N. J.

727 P

734 To THE PITTSBURGH REDUCTION Co., Dr. Manufactur-
ers of Aluminum by the Hall Process

Branch Office, 701 Ferguson Building

Order 13290

2 lbs No. 1 Ingredient at 2.00..... 4.00
Matl.

735

Prices O.K. GBR
Extension O.K. JS
Quantity & Quality O.K. MFB

PITTSBURGH, PA. June 15, 1896

EDISON PHONOGRAPH WORKS
Orange, N. J.

724 P

To PITTSBURGH REDUCTION Co., Dr. Manufacturers of
Aluminum by the Hall Process

736

Branch Office, 701 Ferguson Building

Order 13279

28 lbs No. 1 Ingredient at 2.00..... 56.00
Box 25
56.25

Prices O.K. GBR
Extension O.K. JS Matl 56.00
Quantity & Quality O.K. MFB P&B .25

Defendant's Exhibits.

219

737

**" Defendants Exhibit, Aluminum Voucher
September 1896 "**

PITTSBURGH, PA. Sept. 17, 1896 738

EDISON PHONOGRAPH WORKS

Orange, N. J.

To PITTSBURGH REDUCTION CO., Dr. Manufacturers of
Aluminum by the Hall Process

876 P

Branch Office 701 Ferguson Building

10 lbs-4 oz No. 25 sheet at 72..... 7.38 739

Prices O.K. }

Matl.

Extension O.K. } GBR

Quantity & Quality O.K. MFB

740

174

"Defendant's Exhibit, Stearic Acid Voucher June, 1896."

NEW YORK, June 17th, 1896.

EDISON PHONOGRAPH WRKS. Bought of R. G. MITCHELL & Co. Office 141 Water Street.

Terms Cash.

742

10 bbls Stearic Acid (solid)

326 21

324 21

334 21

335 23

333 22

342 21

334 21

323 22

743

333 20

327 20

Prices O. K. GBR

Extension O. K. JS

Quantity & Quality O. K. MFB

Matl

C. Ashinger

3311—212 = 3099 lbs net at 9c

278.91

NEW YORK, June 24, 1896.

EDISON PHONOGRAPH WRKS. Bought of R. G. MITCHELL & Co. Office, 141 Water Street.

Terms Cash.

744

10 bbls Stearic Acid (solid)

325 22

331 21

333 21

325 22

333 20

318 22

328 22

333 22

332 21

333 21

3290 — 214 = 3076 lbs net at 9c

276.84

Matl

Prices O. K. GBR

Extension O. K. JS

Quantity & Quality O. K. MFB

Defendant's Exhibits. 221

745

**"Defendant's Exhibit, Sal-soda Voucher
June, 1896."**

NEW YORK, June 22nd, 1896. 746

THE EDISON PHONOGRAPH WORKS. Bought of MARTIN
KALBFLEISCH CHEMICAL COMPANY. Offices, 44½
& 46 Maiden Lane & 37 & 39 Liberty St., New
York.

Req. No. 13326.

Orange, N. J.	1 bbl sal soda			
via U. S Express	375	90		747
Orange, N. J.	6 bbls sal soda			
via D. L. & W. R.R.	6 x 375 - 2250	85	19.13	22.51
	Prices O. K.	GBR	Matl	
	Quantity & Quality O. K.	MFB		

748

222

Defendant's Exhibits.

749

"Defendant's Exhibit, Caustic Soda Voucher July, 1896."

750 248

Office 383 West Street

NEW YORK, July 24, 1896.

THE EDISON PHONOGRAPH WKS. Bought of WELCH,
HOLME & CLARK CO., 381, 382 & 383 West Street
and 141 to 149 Barrow Street

Terms 30 days.

1 Dr. Golden Fleece 98% Powdered Caustic Soda

112 lb 5½

\$6.16

751

U. S. xpress Req. No. 13444

Matl

Prices O. K. GBR

Extension O. K. JS

Quantity & Quality O. K. MFB

752

Defendant's Exhibits.

223

753

**"Defendant's Exhibit, Ceresin Voucher
June 1896."**

NEW YORK, June 13th, 1896

THE EDISON PHONOGRAPH WORKS, ORANGE, N. J. BOUGHT
OF SMITH & NICHOLS NO. 143 FRONT STREET.

754

Marked: 3 bags & 1 package White ceresin

No. 1 203½ 2½
 2 203 2½
 3 180 2½ = 586½ - 7½ = 579 lbs
 package 36

615 lbs at 12½

76.88

755

Prices O. K. GBR

Extension O. K. JS

Quantity & Quality O. K. MFB Notice

1% off if paid within 10 days
positively

no cash account allowed thereafter

Material

Order	{	No. 1 U. S. Expr
No. 13272 Shipped at Buyer's risk per		No. 2/3 D. L. & W. R. R. 756
		Package was called for

224

Defendant's Exhibits.

757

**"Defendant's Exhibit—Wax Voucher May
1894."**

MAY 1, 1894

When referring 7 to this bill mention this number

758 EDISON PHONO WKS ORANGE, N. J. DR. TO EDISON
MANUFACTURING CO. 110 EAST 23RD STREET, NEW
YORK, ORANGE, N. J.

1259 Pounds Phonograph Wax at .21 $\frac{1}{4}$ lb.---- \$267.53
O. K. GBR

Checked from Edison Mfg. Co's records
Send checks, money & Letters re-
garding accounts to Orange, N. J.

759

ORANGE, N. J., May 7, 1894

When referring to this bill

36

mention this number

EDISON PHONOGRAPH WKS ORANGE, N. J. DR. TO EDI-
SON MANUFACTURING COMPANY

760 837 Pounds Phonograph Wax at 21 $\frac{1}{4}$ c.----- \$177.86
O.K. GBR

Shipped to you
via Our Wagon.

Defendant's Exhibits.

225

761

ORANGE, N. J., May 9, 1894

When referring to this bill

68

mention this number

EDISON PHONO WKS, ORANGE, N. J. DR. TO EDISON
MANUFACTURING COMPANY

840 lbs Phonograph Wax at 21 $\frac{1}{4}$ c..... \$178.50 762
O.K. GBR.

Shipped to you

Via : Our Wagon

ORANGE, N. J. May 14, 1894

When referring to this bill

113

mention this number

EDISON PHONOGRAPH WKS, ORANGE, N. J. DR. TO EDISON 763
MANUFACTURING COMPANY

839 Pounds Phonograph Wax at 21 $\frac{1}{4}$ ----- \$178.29
O.K. GBR

Shipped to you

Via. Our Wagon

ORANGE, N. J., May 14, 1894.

When referring to this bill

112

mention this number

EDISON PHONOGRAPH Wks Orange, N. J. Dr. to EDI-
SON MANUFACTURING COMPANY

847 Pounds Phonograph Wax at 21 $\frac{1}{4}$ -----\$179.99
O. K. GBR

Shipped to you

Via. Our Wagon

764

765

ORANGE, N. J., May 22, 1894.

When referring to this bill

193

mention this number

766 EDISON PHONO WKS Orange, N. J. Dr. to EDISON MANU-
FACTURING COMPANY

1236 Pounds Phonograph Wax at 21 $\frac{1}{4}$ c.....\$262.65

O. K. C. C. G.

O. K. C. H. J.

Shipped to you

Via.

ORANGE, N. J., May 25, 1894

767 When referring to this bill

230

mention this number

EDISON PHONOGRAPH WKS Orange, N. J. Dr. to EDISON
MANUFACTURING COMPANY

846 Pounds Phonograph Wax at 21 $\frac{1}{4}$ c.....\$179.78

O. K.

768 C. C. G.

CHJ

Shipped to you

Via. Our Wagon.

ORANGE, N. J. May 28, 1894.

When referring to this bill

249

mention this number

EDISON PHONO. Wks Orange, N. J. Dr. to EDISON MANU-
FACTURING COMPANY

770

844 lbs Phonograph Wax at $21\frac{1}{4}$ -----\$179.35

O. K.

C. C. G.

O. K. C. H. J.

Shipped to you

Via our wagon

ORANGE, N. J. May 29, 1894. 771

When referring to this bill

253

mention this number

EDISON PHONOGRAPH Wks Orange, N. J. Dr. to EDISON
MANUFACTURING COMPANY

1251 pounds phonograph wax at $21\frac{1}{4}$ -----\$265.84

O. K.

C. C. G.

O. K.

C. H. J.

Shipped to you

Via

772

228 Defendant's Exhibits.

773

**"Defendant's Exhibit—Wax Voucher
October 1894 "**

ORANGE, N. J., Oct. 2, 1894

When referring to this bill
2014
mention this number

774 EDISON PHONO WORKS ORANGE, N. J. DR. TO EDISON
MANUFACTURING COMPANY

Our Order No.
Customers' Order No. 10848

813 lbs of Wax at 21 $\frac{1}{4}$ c. ----- \$172.76

Wax

Extension O. K. GBR

Entered P. B. GBR

Bill Checked MFB

775

Shipped to

Via :

ORANGE, N. J., Oct. 4, 1894

When referring to this bill
2019
mention this number

776 EDISON PHONO. WKS ORANGE, N. J. DR. TO EDISON
MANUFACTURING COMPANY

Our Order No.
Customers' Order No. 10848

871 lbs of Wax at 21 $\frac{1}{4}$ c. ----- \$185.09

Wax

Extension O. K. GBR

Entered P. B.

Bill checked MFB

Shipped to

Via-----

777

ORANGE, N. J., Oct. 5, 1894

When referring to this bill
2036
mention this number

EDISON PHONO WKS ORANGE, N. J. DR. TO EDISON
MANUFACTURING COMPANY

Our Order No.
Customers' Order No. 10848

778

844½ lbs of Wax at 21¼ \$179.46
Extension O. K. GBR
Entered P. B.
Bill Checked MJS
Wax

Shipped to
Via :

779

ORANGE, N. J. Oct. 8, 1894

When referring to this bill
2065
mention this number

EDISON PHONO WORKS ORANGE, N. J. DR. TO EDISON
MANUFACTURING COMPANY

Our Order No.
Customers' Order No. 10848

780

847 lbs of Wax at 21¼ \$179.99
Extension O. K. GBR
Entered P. B.
Bill Checked MFB
Wax

Shipped to
Via

781

ORANGE, N. J. Oct. 9, 1894

When referring to this bill

2088

mention this number

EDISON PHONO WKS ORANGE, N. J. DR. TO EDISON
MANUFACTURING COMPANY

782

Our Order No.

Customers' Order No. 10848

756 lbs of Wax at 21 $\frac{1}{4}$ \$160.65

Extension O. K. GBR

Entered P. B.

Bill Checked MFB

Shipped to

Via Wax

738

ORANGE, N. J. Oct. 9 1894.

When referring to this bill

2087

mention this number

EDISON PHONO WORKS Orange, N. J. Dr. to EDISON
MANUFACTURING COMPANY

Our Order No.

Customers' Order No. 11187

784

66 lbs of Wax at 21 $\frac{1}{4}$ \$14.03

Extension GBR

Entered P. B.

Bill Checked MFB

Wax

Shipped to

Via

Defendant's Exhibits.

231

785

ORANGE, N. J. Oct. 11, 1894

When referring to this bill

2113

mention this number

EDISON PHONO WORKS Orange N. J. Dr. to EDISON
MANUFACTURING COMPANY

Our Order No.

Customers' Order No. 11187

786

848 lbs of Wax at 21 $\frac{1}{4}$ ----- \$180.20

Extension O. K. GBR

Entered P. B.

Bill Checked MFB

Wax

Shipped To-----

Via -----

ORANGE, N. J., Oct. 15, 1894

737

When referring to this bill

2157

mention this number

EDISON PHONO WKS Orange N. J. Dr. to EDISON
MANUFACTURING COMPANY

Our Order No.-----

Customers' Order No. 11187

788

Oct. 13 842 $\frac{3}{4}$ lbs of Wax at 21 $\frac{1}{4}$ ----- \$179.08

" 15 836 $\frac{1}{2}$ " " "----- 177.76

\$356.84

Extension O K. GBR

Entered P. B.

Bill Checked MFB

Wax

Shipped to you

Via :-----

789

ORANGE, N. J., Oct. 18, 1894

When referring to this bill

2208

mention this number

EDISON PHONO WORKS Orange, N. J. Dr. to EDISON
MANUFACTURING COMPANY

Our Order No.

790 Customers' Order No. 11187

2513 lbs of Wax at 21 $\frac{1}{4}$ \$534.01

Extension O. K. GBR

Entered P. B.

Bill Checked MFB

Wax

Shipped to.....

Via :.....

791

ORANGE, N. J., Oct. 19, 1894

When referring to this bill

2209

mention this number

EDISON PHONO WORKS Orange, N. J. Dr. to EDISON
MANUFACTURING COMPANY

Our Order No.

7:2 Customers' Order No. 11187

2029 lbs of Wax at 21 $\frac{1}{4}$ 431.16

Extension O. K. GBR

Entered P. B.

Bill Checked MFB

Wax

Shipped to.....

Via :.....

Defendant's Exhibits.

233

793

**"Defendant's Exhibit, Wax Voucher,
August, 1890."**

AUG. 11th, 1890. 794

EDISON PHONOGRAPH WORKS Orange, N. J. To EDISON
MANUFACTURING COMPANY Orange, N. J.

Order No. 6202,

1073 lbs No. 3 Wax .20 ----- \$214.60

Via Wagon Received

Aug. 14, 1890

Ans'd ----- 18

795

Wax

Quantity, Quality & Price

O. K.

R. L. SMITH.

795

234

Defendant's Exhibits.

797

**"Defendant's Exhibit, Stearic Acid
Voucher, November, 1895."**

798

NEW YORK, Nov. 25th, 1895

EDISON MFG. Co. Bought of R. G. MITCHELL & Co.
Office 141 Water Street

Terms Cash

7 Bbls Stearic Acid (Solid)

799

334	21	Extension O. K.	M	Mfg. Wax
327	21	Price and }		
326	22	Discount {	O. K. M	
327	22	Received O. K.	D. H.	
330	23	Date Rec'd Nov. 27th, 1895		
327	22	Distributed by	M	
328	22			

2299 153 = 2146 lbs net at 9½c

203.87

800

**" Defendant's Exhibit, Ceresin Voucher,
October, 1895."**

NEW YORK, October 10th, 1895 802

THE EDISON MFG. CO. Orange, N. J. Bought of SMITH
& NICHOLS No. 143 Front St.,

Marked 5 Bags White Ceresin

202½ 2½
203 2½
202½ 2½
202½ 2½
203 2½ = 1013½ 12½ = 1001 lbs at 11½ 116.37 803

Extension O K. JAD
Price and {
Discount { O K.
Received O. K. D. H.
Date Rec'd 10/15 1895
Distributed JAD

Notice
1% off if paid within 10
days
Positively
No cash discount al-
lowed thereafter

Order

No. 7045 Shipped at Buyer's risk per Erie R. R. 804

236 Defendant's Exhibits.

805
"Defendant's Exhibit Aluminum Voucher,
October, 1895."

PITTSBURGH, PA. Oct. 18, 1895

EDISON MFG. CO., Orange, N. J. To The PITTSBURGH
REDUCTION CO., Dr. Manufacturers of Aluminum
by the Hall Process Branch Office, 701 Fergu-
son Building.

291 P

806

5 lbs Al. Bronze Powder at 2.25 11.25
Wax

No. 7276

Extension O K. JAD
Price and }
Discount } O. K. JAD
Received O. K. D. H.
Date Rec'd Oct. 19th 1895
Distributed by JAD

807

PITTSBURGH, PA., Oct. 30, 1895

EDISON MFG. CO.
Orange, N. J.

To the Pittsburgh Reduction Co., Dr. Manufacturers
of Aluminum by the Hall Process Branch Office
701 Ferguson Building

N. Y. 307 P.

808 Your order No. 7306

10 lbs 8 oz. Al. br. powder at 2.25 23.63
Wax

Extension O. K. JAD
Price and }
Discount } O. K. JAD
Received O. K. D. H.
Date Rec'd 10/30/95
Distributed by JAD

Defendant's Exhibits. 237

809

**"Defendant's Exhibit Aluminum Voucher
June 30, 1896."**

PITTSBURGH, PA., June 2, 1896

EDISON MFG. Co. 810
Orange, N. J.

To the Pittsburg Reduction Co., Dr. Manufacturers
of Aluminum by the Hall Process Branch Office
701 Ferguson Building

708 P.

28 lbs 12 oz. No. 1 Ingredient at 2.00	57.50	
12 " 4 " No. 16 Sheet " .58	7.11	811
	64.61	

Wax

Extension O. K.	J
Price and }	
Discount { O. K.	M
Received O. K.	D. H
Date Rec'd 5/2/96	
Distributed by Dollard	

812

238

Defendant's Exhibits.

813

**"Defendant's Exhibit Sal-soda Voucher
October, 1895."**

NEW YORK, Oct. 10, 1895

814 THE EDISON MFG. Co.,

Bought of Martin Kalbfleisch Chemical Company
Offices 44½ & 46 Maiden Lane & 37 & 39 Liberty
St New York

Order No. 7048 3 bbls Sal Soda

375

375

375 1125

90----\$10.13

815

Marked E
Orange, N. J.
via Erie R. R.

Extension O. K.	JAD
Price and }	
Discount { O. K.	
Received O. K.	D. H.
Date Rec'd	10/15 1895
Distributed by	JAD

Wax

816

804

Defendant's Exhibits. 239

817

**"Defendant's Exhibit Caustic Soda Voucher
July, 1895."**

075

OFFICE 383 WEST STREET
NEW YORK, July 26th, 1895

THE EDISON MFG. CO.

818

Bought of Welch, Holme & Clark Co. 381, 382 & 383
West Street and 141 to 149 Barrow Street

1 bbl Golden Fleece 98% Powdered Caustic Soda

462-64 398 lbs 4½ ----- \$17.91

Cartage ----- .30

\$18.21 819

Wax 17.91
Genl Ex. 30

18.21

Erie R. R. Order No. 6995

Extension O. K.
Price and }
Discount } O. K.
Received O. K. D. H.
Date Rec'd 7/29/95
Distributed by

820

240

Defendant's Exhibits.

821

**"Defendants Exhibit Alum, Voucher, April,
1893."**

822

NEW YORK, April 4, 1893.

EDISON MFG. Co. Bought of MARTIN KALBFLEISCH'S
SONS Co., Office 55 Fulton Street, Cor of Cliff St.,
New York.

No. 426 4 lbs Lump Alum

Ea 400 = 1600 1.80 ----- 28.80

Received Apr 8 1893

Answered ----- 189

823

Mfg. Wax C. B. S. L.
J. W. Gladstone

Hooper

Via

N. Y. L. E. & W. R. R.
Orange Branch

824

Defendant's Exhibits.

241

825

**"Defendant's Exhibit, Acetate Alumina
Voucher, March, 1889."**

E. MERCK
Manufacturing Chemist,
73 William Street.

Registered number 6703

NEW YORK, March 4th, 1889

826

Sold to M THE EDISON PHONOGRAPH WORKS,
Orange, N. J.
Shipped by Colt's Express

60 lb Acetate Alumina, dry 60c lb.-----\$36.00

Mat.

W

Quantity, Quality & Price

O. K.

Chas. B. Crook

827

E. MERCK

Manufacturing Chemist,
73 William Street.

Registered number 6831

NEW YORK, March 7th, 1889

Sold to M THE EDISON PHONOGRAPH WORKS,
Orange N. J.
Shipped by Colt's Express

828

200 lb Acetate Alumina, dry 50c lb.-----\$100.00
.2 x 100 lb

Mat.

W

Quantity, Quality & Price

O. K.

Chas. B. Crook

829

E. MERCK

Manufacturing Chemist

73 William Street,

NEW YORK, March 12, 1889.

Registered Number 6993

Sold to M THE EDISON PHONOGRAPH WORKS, Orange,

830 N. J.

Shipped by Colt's Express

100 lb. Acetate Alumina, dry, 50c lb. \$50.00

Quantity, Quality & Price

O. K.

Mat.

W

Chas. B. Crook

831

E. MERCK

Manufacturing Chemist

73 William Street,

NEW YORK, March 15th, 1889.

Registered Number 10146

Sold to M. THE EDISON PHONOGRAPH WORKS, Orange,

N. J.

Shipped by Colt's Express.

832

374 lb. Acetate Alumina, dry in 2 cases 50c lb \$187.00

1 x 134 lb

2 x 120 lb

Mat

W

Quantity, Quality

E. MERCK

Manufacturing Chemists

73 William Street,

NEW YORK, March 20th, 1889

Registered Number 10536

Sold to M THE EDISON PHONOGRAPH WORKS, Orange,
N. J.

834

Shipped by Colt's Express

100 lb Acetate Aluminum, dry 50c lb----- \$50.00

Quantity, Quality & Price

O. K.

Mat

W

Chas. B. Crook.

E. MERCK

835

Manufacturing Chemist,

73 William Street

NEW YORK, March 23rd, 1889

Registered Number 10806.

Sold to M THE EDISON PHONOGRAPH WORKS, Orange,
N. J.

Shipped by Colt's Express

836

133 lb Acetate Aluminum, dry 50c lb----- \$66.50

Quantity, Quality & Price

O. K.

Mat

W

Holland

How much have we received

244

Defendant's Exhibits.

837

**"Defendant's Exhibit—Macdonald bill, Jan.
27, 1890.**

ORANGE, N. J. Jan. 27, 1890.

Order No. 1552

838

THE NORTH AMERICAN PHONOGRAPH CO., 160 Broadway,
New York, To—EDISON PHONOGRAPH WORKS, Dr.
Office and Works, Lakeside Ave., P. O. Box 1008.

Telephone 305.

Invoiced Van. Checked C. F. A. Approved H. M.

839 Jan. 27 1 box of 24 blanks 7- $\frac{1}{2}$ ----- 1.80
Shipped to—T. H. MacDonald,
c/o Am Graphophone Co.,
Bridgeport,
Ct.

Via U. S. X.

Cases 1 Barrels

Crates Packages

Bill of Lading.

840

Defendant's Exhibits.

245

841

"Defendant's Exhibit—Columbia Phonograph Co., bill Oct., 1889.

ORANGE, N. J. Oct. 21, 1889.

Order No. 959

842

THE NORTH AMERICAN PHONOGRAPH Co., 160 Broadway,
New York, To—EDISON PHONOGRAPH WORKS, Dr.
Office and Works, Lakeside Ave., P. O. Box 1008.

Telephone 305.

Oc. 21	6 Phonographs Style "T"	
	Nos. 4309, 4346, 3986, 3758, 3062, 4371	
	1 Bbl. (150) Phono blanks.....	\$11.25 843
	Bbl and Packing.....	.25
		\$11.50

Phonographs shipped from your
stock.

This completes your stock of
Phonos Style "T".

Shipped to—Columbia Phono Co.

Washington, D. C..

844

Via—Colts Ex. c/o P. R. R.

Cases Barrels 1

Crates 6 Packages.

845

"Defendant's Exhibit - Macdonald Fargo Letter."

C. MELZER

Successors to

A. Melzer & Co.

Partners

Adolph Melzer

Charles Melzer

SOAPS

846

EVANSVILLE, Ind., Feby 15, 1895

MY DEAR MR. FARGO: I ship you today by Adams Express a carboy of chemicals for cylinder work.

Hereafter for purposes of references this will be known as "Liquor."

847

Make a batch of 300 lbs at a time. Melt down 300 lbs of the filtered stock you have there in the barrels and when it is all melted, and at 200 deg. (about) F. add slowly, a quart at a time 60 lbs (sixty pounds) of the Liquor. *Stir Vigorously* all the time the Liquor is being added. The adding of the Liquor should extend over about $\frac{3}{4}$ of an hour. Raise the temperature as usual up to about 340 deg., not more. When all foaming has practically ceased let it stand at about 300 deg. to 320 deg. for 10 or 12 hours. Then mold as usual.

You will note that the proportion of stearine to Liquor is 5 to 1.

848

Make up as much material as you have. There is 133 pounds of Liquor in the carboy. This would make up 765 lbs of stearine. Make that up if you have it.

All that you mold the first day should be shaved the next morning and the shavings and overflows added the next day to the days work thus keeping the color regular. Rush the work along as fast as you can. Use your best judgment and you will get along all right. *Filter well.* That is the most important part.

Yours truly,

T. H. MACDONALD

Mgr Factory.

d-Fargo

**"Defendant's Exhibit, Fargo Note Book
No. 1."**

Dr. E. S. Warnes	Dr.
1891	
Sept. 29th to 39 h work at .30	11.70
1892	
Jan. 24th " 4 h " " .30	1.20 850
Feb. 14th " 3 h " " .30	.90
To cabinet for bath room	5.00
1893	
Feb. 13th 6 h Work at office at .30	1.80
" 14 7 h " " " " .30	2.10
" 15 6 h " " " " .30	1.80
" 16 4 h " " " " .30	1.20
	25.70
1894.	851
Jan. 8th To 2 h work at .30	.60
Apr. 19 " 1 h " " .30	.30
" 27 " 3 h " " .30	.90
May 2nd " 4 h " " .30	1.20
" 8 " 2 h " " .30	.60
" 19 " 7 h " " .30	2.10
" 29 " 1½ h " " .30	.45
June 5 " 3 h " " .30	.90
" 6 " 2½ h " " .30	.75
" 8 " 2½ h " " .30	.75 852
" 11 " 3 h " " .30	.90
" 12 " 4 h " " .30	1.20
" 13 " 2 h " " .30	.60
	36.95
94	
June 19 To 4 h work at .30 per hour	1.20
" 20 " 3 h " " .30 " "	.90
" 25 " 3 h " " .30 " "	.90
" 26 " 2 h " " .30 " "	.60

Partners
 Olph Melzer
 Charles Melzer

15, 1895
 by Adams
 no
 his will be

down 300
 the barrels
 (about) F.
 pounds) of
 the Liquor
 should ex-
 temperature
 When all
 at about
 then mold

stearine to

There is
 could make
 have it.
 shaved the
 lows added
 the color
 s you can.
 t along all
 tant part.

ALD
 Factory.

853

July 8 To 2 h work at .30 per hour	-----	.60
" 10 " 3 h " " .30 " "	-----	.90
		42.05
Aug. 8 to 1½ h work at .30 " "	-----	.45
" 9 " 1½ h " " .30 " "	-----	.45

FOR NERVOUSNESS.

854

Asa foetida
 5 grain coated Pills
 1 Pill every 3 hours
 From New York World Physician or Physicians
 Department

FOR LA GRIPPE.

Muriate of Ammonia	-----	2 drams
Tinct. of Henbane	-----	2 drams
855 Brown Mixt.	-----	1 ounce
Syrup of Wild Cherry Bark	-----	3 ounces
Dose 1 Teaspoonful every 3 hours		

Oct. 8th 95 2 ton No. 2 Nut Coal W. E. C. C.

Dec. 6th " 2 " No. 2 " " "

There was about $\frac{3}{4}$ of a ton in bin when last coal came.

FORMULA FOR MIXING HARD WAX CYL.

856

24 lbs. best stearine. Brand used was ("AA") from
 A. C. Belden & Co., New York.

Melt stearine in porcelain lined kettle. Raise to
 temperature of about 350 deg. F. then add 3 lbs. caustic
 soda. Add soda slowly stirring vigorously; after
 the soda is thoroughly dissolved (or united with stearine
 which will take some little time, we have stearic
 soap. To this add 12 lbs Best Black Ozokerite (Ozokerite
 boiled at a temperature of about 375 deg. F for
 18 or 20 hours. This is necessary to drive off volatile

857

oils which it contains. Add B O in a melted state, stirring well till thoroughly united, then add 3 lbs. acetate (sugar) of Lead. This will cause some foaming for a short time but will soon settle and become quite free from bubbles. Keep at temp of about 375 deg. for 5 hours and then filter about 20 thickness of cheesecloth.

Melting Points	Centigrade	Farenheit
Prepared Suet.....	39.5	103
Spermaceti.....	38	100
White Wax.....	65.5	150
Yellow Wax.....	60	140

I. Mixt.

Str.+BO+Scau+Al
86 22 11 21

Melt Str & Bo separately and cook 2 hours then unite stirring well in and cook 2 h at a temp of about 330 deg. F. Was called away and Mixt. was cold for 3 days. Then melt & heat to 330 deg. about and add Scau slowly (taking 1 hour to add). Scau was some that had been exposed to air and collected moisture so was in a liquid state when used having stood three days. After adding Scau cooked at about 350 deg. for 5 hours, then added Al slowly (1 hour) cold over night, melted next morn and cook at 350 deg. for 4 hours. Mixt accidentally got very hot and came very near burning, I should judge.

E Cyl weigh before finising 13 oz. and Big Iron Pot Holds 375 lbs about or about 350 lb about 2 in from top.

D Mixt. May 23rd, '94

Str.+Bo+Scau+Al
384 96 48 48

861

Melt No. 1 and No. 2 separately and cook 2 h add together and cook two hours at about 300 deg. or a little more, add Scau slowly (1 hour). Found that Scau did not dissolve quickly, that the lumps seemed to gather the Bo or Str. & Bo. in the shape of a coating around the lump and it did not dissolve readily. Cook 5 hours at from 330 to 350 deg. Add Al (1 h). Then keep at about 350 deg. for 4 h.

862 Mixt. E

Mixt. D+Al
64 5

Temp. of 350 deg. for 3 hours. A good Cyl. This was made on May 23rd and on Sept. 29th. There is not a trace of blue mold and the Cyl is as bright as a new dollar.

863 Mixt. G

Mixt. D+Bo Good
64 5

Mixt. H Blue

Mixt. D+Str.
64 5

Mixt. No. 10 Sept. 19th

864

Str.+Al+Bo+Scau
48 8 8 5

Sept. 22nd
16 times foamed.

48 lbs. 8 lbs. 8 lbs. 5 lbs.

Mixt at high temp.

Melt and cook Str 15 min. add Al 5 min. cook 5 min. add Bo 5 min. cook 5 min., add Scau 5 cook $\frac{1}{2}$ h. Cold next morn, melt and cook 3 h. Found last cooking made a great deal finer and better grain and mix is

865

fine, much like phono mix but there is a slight trace of blue (not much) after a week standing.

No. 15 mixt same as No. 10, only Bo used was some that had been cooked $9\frac{1}{2}$ h at a gentle heat and filtered also increased all the ingredients Str 1 lb. & Etc.

Str. + Al + Bo + Scau.

64 $10\frac{2}{3}$ $10\frac{2}{3}$ $6\frac{2}{3}$ This mixt shows up better than any, no blue after about 1 week and fracture shows a dull color and not that glassy surface. At the same time it is very fine close grain and looks just like the Edison Mixt. 866

Aluminum acetate used in place of Acetate of Lead for McDonald Mixt. Bought of Merck & Co.

Mfg. Chemists

71 & 73 William St.

N. Y.

867

The Stearine is a fine pure white and Fracture shows little particles of something that shines like little specks of Mica. Mr. McDonald says there is Parrafine added to the Stearine and that it is a special preparation but think it is only a fine grade of stearine used for making candles.

The caustic soda is powdered and comes in Black Tin Cans, 1st can had white label with blue and red lettering—think it is an imported soda but not sure.

868

Big Pot Mixt.

280 lbs. special Stearine and something like 2 cans of caustic sode used to saponify and then about should say 2 lbs. of Acetate of Aluminum (or one scoop) of the Torsion Balances about 6 or 7 in. across.

Can of Caustic Soda = 10 lbs.

Merck & Co., Mfg. Chemists, N. Y.

140 lbs. Str. (Special") bought from (Candle Makers).

869

Mr. McDonald says that there is 5% of Paraffine added to it.

52½ lbs. Special Stearine + 12½ lb. Bo (pure).

Evansville Mixt I think is made after this formula.

51 oz. Stearic Acid (Admantine Stock).

9 oz. Paraffine.

10½ oz. 37½% Lye.

870

¾ oz. Aluminum Oxide Precipitat.

E. Merck, Germany, Darnstadt.

Stearic acid is simply the stearine with all foreign matter expressed leaving the pure Stearic Acid which is very hard dry white substance.

MIXT. FOR HARD WAX CYL.

210 lbs. Admantine Stock.

(Stearine + 5% paraffine. A. Gross & Co., N. Y.

26 lbs. pure Paraffine.

871

3¾ " Hydrate of Aluminium.

42½ lbs. 37½% lye made from Greenleafs Caustic Soda.

Troy Laundry & Mach. Co., Agents, New York.

Another Mixt.

7 lbs. Admantine stock melted, add 8 oz. Greenleaf's Soda. 2½ oz. acetate of Aluminium.

872

To reduce Centigrade Scale to Farenheit divide the number of degrees (C) by 5 and multiply the result by 9, then add 32 and the answer will be degrees of Farenheit (See following example :

$\frac{9}{5}$) 159 centigrade

31½

9

279

7½

286½

32

318½ degrees Farenheit

873

Can Greenleaf's Caustic Soda Weighs—

Gross.....	9 lbs. 13½ oz.
Can	14½
	8 15¾

Found that the Stearic Acid (said to be pure) bought of Schneider & Co. of Chicago, gave the best results. Mixtures made from this were *dry* and hard 874 in fact were about as near perfect as possible to make it. Also the pure Stearic Acid of Belden & Co. of New York was successful in mixtures.

37½% Lye. Take 10 gal. of Distilled Water (water that has condensed from steam, or snow melted) and heat up till you can hardly hold your hand in it without burning hand. Place this water in an earthenware Jar or something of the kind and stir in Greenleaf's soda caustic till the Hydrometer (an instrument 875 for determining the density of heavy liquid after the old fashioned idea of floating an egg in it, and if it was heavy (or dense) enough it would float and if not it would sink) Would register 37½%. 1st 10 lb can of Scau was added and then part of another, then tried Hydrometer and I think the balance of the can was added and part of another at any rate go slow until the Hydrometer registers 37½%. If it is too strong more water can be added till it is O. K. I think it wants to stand a while before you can get the full 876 strength (a few minutes at least). After standing a skin of something comes over the top. The Lye should be filtered through filter paper before using. This is as near the way to make 37½% Lye as I can tell now from having helped Mr. Macdonald make it and what I have seen of the making.

Later I think about 15 lbs soda to 10 gal distilled water is what is used to get 37½%.

877

A Formula for hard wax—

60 parts adamantine stock
 6 " paraffine
 $\frac{3}{4}$ " Hydrate of Aluminum dissolved
 12 " 37½% Lye

878 The aluminum is dissolved by herting the Lye and after it gets pretty warm add the aluminum and keep stirring while temp. is raised to 230 or 40 deg. F and the liquid gets *clear* then add the rest of mixt (Str. & Paraff.)

The previous mixtures have all been too soft or sticky and shaving would not crumble under the finger to nothing when cut, cut like cheese or something like it.

879 The following mixts are *very* good and Mr. Childs the musical expert for Columbia Phonograph Co. says they are as good as the Edison.

No. 114 Mixt.

100 oz. Schneiders Stearic Acid.

2 oz. Penna Salt Co. Hydrate of Aluminum.

21 oz. 37½% Lye (H_2O).

Less lye on account of leaving out Nigger Wax (black ozokerite).

No. 115. *Mixt.*

same as above with exception of 6% Nig. Wax added.

880

No. 116.

51 oz. melted Schneider Str Acid

5 oz. Nig. Wax (Bo)

1 oz. Hydrate of Aluminum

11 oz. 37½% Lye

No. 117.

150 oz. Schneider Str. Acid

32 oz. Troy L & Mach. Co. Soda Caustic

3 oz. Penna. S. Co. Hyd. of Aluminum

9 oz. Wallace (Nig Wax I think)

881

In No. 117 the Nig. wax added the last thing causes less foaming than when added first after the Str Acid and makes a better mixt. In these mixtures after water is all out temp should not rise to over 320 to 30 deg. Fahrenheit

Large batch of No. 117 Mixt.

200 lbs Pure Str. Acid (Beldens I think) Melted and at about 200 deg. F. then add—

26 lbs 37½% Lye to which had been added

882

4 lbs Penna Salt Co. Hyd. Of Aluminum

and whole raised to 242 deg. F. till solution clears itself and then add to mixt.

Mixt will foam quite a little but if fire is made as hot as possible and water cooked out fast will not raise up very high in pot—after water is all out mixt will go down to its level and before foaming gets through care should be used that temp is kept down as when the water leaves mixt temp. will go up very rapidly—as soon as foaming is done add 12 lbs of Nig. Wax and in this case Nig Wax was melted and filtered through lawn and cheese cloth and then added to mixt. Stir in well and cook until all ebulation ceases and mixt is free from foam almost and has a leathery look. I think this is correct formula for one of the best mixt there is yet and am *sure* of everything but the quantity of aluminum & Nig. Wax and am pretty sure of those.

July 20th, 96.

Samp. Lot of 206 lbs Stearic Acid sent on by Smith & Nichols of N. Y. City is even better than Schneider & Sons stock and at a cost of a little over 8 cts per lb. (08 to 9¾ cts)

884

July 20th

Schneider has been sending at 10½ cts put up in bags marked pure saponified Stearic Acid. Have been trying four tons at a time although we got less quantity for same price.

885

12—2 ft x $1\frac{1}{2}$ in x $\frac{7}{8}$ "
 12 2 ft 9 in x $1\frac{1}{2}$ in x $\frac{7}{8}$ "
 8 2 ft 7 in x $1\frac{1}{2}$ in x $\frac{7}{8}$ "
 8 2 ft 9 in x $1\frac{1}{2}$ in x $\frac{7}{8}$ "
 10 23 in x $1\frac{1}{2}$ in x $\frac{7}{8}$ "
 10 2 ft 9 in x $1\frac{1}{2}$ in x $\frac{7}{8}$ "
 6 1 ft 6 in x $1\frac{1}{2}$ in x $\frac{7}{8}$ "
 6 2 ft 9 in x $1\frac{1}{2}$ in x $\frac{7}{8}$ "
 36—2 ft 9 in

886

12 2 ft

BILL OF STUFF FOR DR. WARNES WINDOW SCREENS
 WHITE PINE CLEAR STOCK

26 pieces 2 ft 9 in x $1\frac{1}{2}$ in x $\frac{7}{8}$ "
 12 " 2 ft x $1\frac{1}{2}$ in x $\frac{7}{8}$ "
 8 " 2 ft 7 in x $1\frac{1}{2}$ in x $\frac{7}{8}$ "
 10 " 23 in x $1\frac{1}{2}$ in x $\frac{7}{8}$ "
 6 " 1 ft 6 in x $1\frac{1}{2}$ in x $\frac{7}{8}$ "

887

Free from shakes
 Mr. Westlake

SIZES OF WINDOWS FOR SCREENS

22— $\frac{1}{8}$ in 2 upstairs 2 D. Room 2 B. P.
 30— $\frac{1}{2}$ in 2
 30— $\frac{3}{4}$ in 2
 22 2
 22— $\frac{1}{4}$ 3
 888 16 in 11 upstairs 1 B. P. downstairs
 31— $\frac{1}{2}$ in high upstairs
 33 in high downstairs

June 5 $1\frac{1}{2}$ h time

T. H. Mac Donald to C. B. Fargo, Dr.

July 16	To $1\frac{1}{2}$ h work at 20 cts	-----	30
" 17	" $1\frac{1}{2}$ " " " 20 "	-----	30
" 18	" $1\frac{1}{2}$ " " " 20 "	-----	30
" 19	" $1\frac{1}{2}$ " " " 20 "	-----	30
" 20	" $\frac{1}{2}$ " " " 20 "	-----	10

Paraffine

ure).

ormula.

July 25	To 1½ h work at 20 cts.....	30	889
" 26	" 2 " " " 20 "	40	
" 27	" 1 " " " 20 "	20	
		<u>2.20</u>	
Aug. 1st	" 1½ " " " 20 "	30	
		<u>2.50</u>	

Moved over to East Bpt. while Father and Fred went south for Fred's health. 890

l foreign
acid which

Up to June 7th, 96 I had turned in \$56.69 cts and later gave Father \$5.00 for Fred. Father had put in \$116.75, Frank \$120.94 Ed. 130.

Analysis of Edison Cyl.—

, N. Y.

Caustic

ork.

reenleaf's

divide the
result by
es of Far-

Str. Acid.....	79.580	
Ozokerite	11.790	
Resin.....	0.000	
Sodium Oxide Na ₂ O.....	4.752	891
Iron Fe ₂ O ₃	0.020	
Manganese Da Mn ₂ O ₃	0.048	
Sulphuric Acid So ₃	1.641	
Aluminum Oxide Al ₂ O ₃	1.998	

Sept. 26, 95

260 lbs Schneider Stock 10½ later
57 lbs 37% Lye (1 lb Seau 4¼ cts) to 2 lb water at 11 cts
4 lbs Penna Salt Co. Hyde of Aluminum at 5¼ 892
42 lbs American Wax & Paper Co. Paraffine at 7½c.

Regular Mixt:

$$\begin{array}{l} \left. \begin{array}{l} 306 \\ 66 \\ 5\frac{1}{4} \\ 50 \end{array} \right\} \div 6 \left\{ \begin{array}{l} 51 \\ 11 \\ 7\frac{7}{8} \\ 8\frac{1}{8} \end{array} \right\} \\ \left. \begin{array}{l} 260 \\ 57 \\ 4 \\ 42 \end{array} \right\} \div 5 \left\{ \begin{array}{l} 52 \\ 11\frac{2}{3} \\ 4\frac{4}{5} \\ 8\frac{2}{5} \end{array} \right\} \times 6 \left\{ \begin{array}{l} 312 \text{ stock} \\ 68\frac{2}{3} 37\% \\ 4\frac{4}{5} \text{ salt} \\ 5\frac{2}{5} \text{ Par} \end{array} \right\} \end{array}$$

893

5	P. Cyl weigh	15 oz.
1	P " "	3 oz.
1	"E" " "	7 oz.
	Paper tube & shells	$\frac{1}{4}$ oz.
Net wax in 'E' Cyl		$6\frac{3}{4}$ oz.

Oct. 11th, 95

894

1 Drum of Caustic Soda 76%

650 lbs net at .02723 = \$17.70

Ster. Acid .11 cts Schneider & Sons

10 $\frac{1}{8}$ cts laterParaffine 7 $\frac{1}{4}$ cts, American Wax & Paper Co.

Oct. 17th, 95

75 unfinished P. Cyl. with 75 dverflows weigh 30 $\frac{1}{2}$ lbs.75 Finished Cyl. weigh 13 $\frac{1}{2}$ lbs.

895 The quantity of shavings, etc., added to new stock should be 1.2592 times the quantity of new stock or to regular batch of 356 lbs New add 448 lbs of Old Total 804 lbs

804 lbs = 4466 Finished Cyl

or

804 lbs = 1.977 moulded Cyl

Analysis of Edison Cyl.

		Old
	Stearic Acid	79.580
	Ozokerite	11.790
896	Resin	0.000
	Sodium Oxide Na ₂ O	4.752
	Iron Fe ₂ O ₃	0.020
	Manganese Da Mn ₂ O	0.008
	Lead Da Pb ₂ O	0.048
	Sulphuric Acid So ₃	1.641
	Aluminum Oxide Al ₂ O ₃	1.998
		99 837

897

Caustic Soda 76% at .0237½ cts by the drum of about 700 lbs each bought of Edw Hills Son, 25 Cedar St., New York

Stearic Acid saponified bought of Schneider & Son Chicago, Ill. at 10½ cts per lb, two to three and four tons at a time *Good*. Later bought of Smith & Nichols, 143 Front St., N. Y., at 8¾ cts with 1% off if paid within 10 days.

Aluminum Oxide bought off Pennsylvania Salt Co. Phila, Pa or Pittsburg, Pa. at 5¼ cts per lb.

898

Paraffine at 7½ cts of the American Wax & Paper Co. also C. M. White Ozokerite at 13 cents

Wm " " at 12 cts

S S White Ozokerite at 14 cts

Yellow " " 11 cts

Greenbanks 98% Caustic Soda bought of Troy Laundry & Machine Co., N. Y. 10 lbs in can.

Mixture made by Stormes which he says is the Edison Mixture, is as follows :

100 lbs Smith & Nichols Stearic Acid melted in gas pot. 15 lbs City water put into Steam Pot and add 22 lbs Sal Soda and when dissolved add 1 lb Greenbanks 98% Caustic Soda (Powdered) then when boiling add a quantity (about 6 inches in diameter x 1 in deep) (I should say 1 lb) of a Powder (Aluminum Brz. (Bronze) Powder) bought of the Pittsburg Reduction Company of New York, Room 10 & 11 Havemeyer Bldg., 26 Cortlandt St., N. Y. Powder added slowly—*foams*—After Liquor is done foaming, filter and add to Stearic Acid without heating up any more than it is after filtering.

Storms says he use to run a steam pipe into the kettle and mix his liquor that way. After liquor has done foaming it will stand any heat almost without foaming again—when it is added to stearine should dip about a half pint or less in dipper and tip just enough to let little of steam flow over into hand dipper when it will foam violently and liquor should go in

901

very slowly—after all foaming is done add 20 lbs of white ozokerite (or Sirisene or Ciricine) melted and then cook short time—filter through canvas or drilling and mould. Smells Bad Good Lye.

Mr. MacDonald says the quantity of Aluminum Bronze Powder is 1 lb to 300 lbs stock.

62 oz. Stearic Acid
Dis- { 4 oz. 47½° Lye (Caustic Soda)
902 solve { ½ oz. Pure alumina (Sheet Alu)
17 oz. 32° Sal Soda Lye
12 oz. White ozokerite.

WALCUTT & LEEDS

53 East 11th St.

N. Y. City

EMPIRE STATE PHONO. Co.

Buffalo, N. Y.

903

Number of prescriptions and for what used.—
3 mo. 28th day 93 No. 32086 J. A. Leverty's cough
cure used for cough accompanying "The Grip"
(Good) Lockhart, Dr.

8-13-94 No. 37891 J. A. Leverty

Regulator Medicine (Female)

Sig. 1 teaspoonfull 3 times a day in water

Lockhart.

WARNER PHARMACY

904

No. 23638 Aug. 31st, 92

Gargle I think for Inflamed Throat. Might have
been for internal use, *Not Sure*

One teaspoonful three times a day

BULLS HEAD PHARMACY,

J. A. Leverty

42158, Teaspoonfull 4 times a day in water, Before
meals and before retiring. For pain in *lower* part of
stomach, caused by cold in bladder & intestines around
it. Wear suspensory also.

**Defendant's Exhibit, Fargo Original Note
Book, No. 1.**

Sep. 18

127 E in 2½ k
Kroeger & myself

Nov. 1st, 95

906

EXPERIMENTS

No. 1 Plain Soap—*No softening*

No. 2 100 lbs New P. S. + 100 lbs shaving, etc. for
Chicago T. M. Co. *Special Order*

No. 3 100 lb. New P. S. + 50 lbs shaving etc. for
Chicago T. M. Co. *Special Order*

5%

No. 4 10 lbs New P. S. + 8 oz. Parf

4%

No. 5 10 lbs New P. S. + 6½ oz. Paraf
about 3%

907

No. 6 10 lbs New P. S. + 4¾ oz Par

No. 7 10 lbs New P. S. + 3 oz. Parf.

Cold over night—remelt and mould in morn.

No. 8 10 lbs New P. S. + 16 oz. W. Oze. Added
when all melted. A small apple cut up into small
pieces

Wanted

Jan. 9th, 1 Ton Nut Coal

908

" 9th, ½ bbl Salt of Alu.

Oct. 21st, made batch of 356 lbs add 450 lbs shav-
ings, total about 806 lbs, call 800 lbs. Tuesday at
10:30 A.M. start to mould.

Tuesday, Oct. 22 moulded 1005 P

Wed. 23 695 P

Thurs

1700

90.)

Tuesday, Oct. 22, 1005 P Moulded
 857 cyl ready for shipment from the 1005 Rough
 Cyl. or about $155\frac{1}{4}$ lbs finished stock
 371 lbs shavings, overflow, etc.

551 Finished Cyl $\left\{ \begin{array}{l} 1408 \text{ F. Cyl.} = 244 \text{ lbs} \\ 508\frac{1}{2} \text{ lbs shaving, etc} = 752\frac{1}{2} \text{ lbs} \end{array} \right.$

$137\frac{1}{2}$ lbs. shavings, etc.

910 800 lbs original mixt. about

Wood handle dipper (long) used for ladling out of
 big pots into filter about $\frac{3}{8}$ inch down from top weighs
 9 lbs. Of new mix use 4 dippers full and of Old five
 dippers full and 40 times 9 lbs. = 360 lbs. new mixt.

50 times 9 lbs. ----- = 450 lbs old

806 lbs. stock $450 + 356 = 1982$ unfinished cyl with
 overflows.

806 lbs. stock $450 + 356 = 4477$ P Cyl. finished, on

911 *overflows.*

W. O. Mxt. Reg. mxt., with the exception of W. O.
 Cyl marked X moulded Nov. 8th and turned before
 hardly cold & Record (nigger) put on right away, some
 scratch but pleasant beside some others.

One marked X1 made same as regular with excep-
 tion of the 10% W. O.

$6\frac{2}{3}\%$ B. O.

912

A day's work moulding P. Cyl. Stopping to heat
 up then putting out the gas and allowing to drop down
 to 300 deg. F. from 338 deg. F., also allowing for filter-
 ing, etc., is 1740 P. Cyl. and 1800 could be done by
 using a little more speed. Above is an easy, comfort-
 able day's work.

2000 cyls. is a day's work when we don't have to
 stop to heat up.

October 26th, 1895.

612 lbs. paraffine at $7\frac{1}{2}$ cts.-----\$45.90

Oct. 31st, 237 lbs. white Ozokerite at 14 cts. 33.18

Oct. 11th, Drum of 650 lbs. caustic soda at .02723c. 17.10

No. 1st, 88 lbs. net Al. Ox. at $5\frac{1}{4}$ c. per lb. 4.62

Small bbl. several lbs. lost in shipping (12 lbs lost in transit). 914

Schneider stock 11 cts. per lb., later $10\frac{1}{8}$ cts., two tons one lot, 7919 lbs., next lot May 27th, 9 cts. 49 bags

July 25th, 1488 lbs. soda at .0237 $\frac{1}{2}$ 60%\$44.76

EDWARD HILLS SON,
25 Cedar St.,
New York.

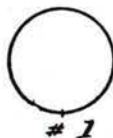
75 P. Cyl. weigh. 13 $\frac{3}{4}$ lbs. net
50 P. " (same ones) 9 $\frac{1}{8}$ " " 915

Peter Carlson
Turned Saturday, April 11th 96(9 hours time),
1813 P. Cylinders.

Walcutt & Leeds, 53 East 11th St. N. Y. City.
Empire State Phono. Co.
Buffalo, N. Y.

500 lbs shavings fill No. 2 steam pot to $12\frac{1}{8}$ in from 916
top of inside shell to top of liquid wax.

600 lbs shavings melted = $9\frac{1}{2}$ inches from top of in-
side shell directly to front of pot.



917

$3\frac{3}{8}$ in = 100 lbs in weight
 800 lbs $2\frac{3}{4}$ in from top of inside shell to top of liquid.

Smith & Nichols
 143 Front St., N. Y.

1% off if paid in 10 days $8\frac{3}{4}$ cts per lb

918

TABLE OF HEAT BY STEAM

Steam Pressure	Deg. Farenheit
90 lbs	331 - 3
95	334 - 6
100	338 - 0
100	344 - 2
120	350 - 1
130	355 - 6
140	361 - 0

919

Edison Mixt.

100 lb. Schneider Stock
 20 lbs White Ozo.

15 lbs water + 22 sal soda, about 16 oz. of caustic soda—Greenbanks 98% some powder about 2 oz dont know what it is

Some powder of a slate color think there was about 20 oz or about that of the powder.

920

1891 Went to work Gr

1892

1893 laid off spring Walter Peck, about New Years on 93-4

100 lb Stearic Acid melted in one pot

15 lbs water in steam kettle, add about $22\frac{1}{4}$ lbs sal soda also + enough caustic soda to make up 23 lbs (about 10 or 12 oz. Powdered Greenbanks 98%) then when boiling add some kind of a powder which was of a slate color and put up in oiled paper or at least the

921

paper was oiled from the powder if not oiled paper—
think there was from 10 to 20 oz. used—after this had
boiled a short time add very slowly to stearic A. take a
little in dipper and fill dipper gently.

Stearic A and look out for foaming over. After all
in add 20 lbs. melted white ozokerite or (cericene).

MIXT.

B

922

No. 139+165+143+00 +A Amt. 3 drops.

48 $\frac{3}{4}$

Mould Oct. 24th afternoon with *new filter* in pot 297 new
Oct. 23rd-----375 old

672 total

255 Stock.

37 $\frac{1}{2}$ boiling little while before S was added, then
come to boil & cook short time and then cool down, 923
just before using heat up nearly to boiling and add to
stock when latter is at 260 to 265 deg. Farenheit.

Very little foaming and done quickly 1 $\frac{1}{4}$ h.—42 P.
added 340 let up to 380 cool for night mix with 375
lbs. shavings, overflows and broken cyl.

921

925

			M	T	W	T	F	S	Tot'l
	Week endg.	Apr. 8	13						
	" "	Apr. 25	13	13	13	13	13	9	
	" "	May 2	13	13	13	10	10	9	
	" "	May 9	S 10						
926	" "	May 16	10	10	10	10			
	" "	23							
	" "	30							
	" "	June 6							
	" "	13							
	" "	20							
	" "	27							
	" "	3							
	" "	10							
	" "	17							
	" "	24							

927

FOR EDISON CYL. EXP.

30 lbs. Fairbanks 98% Caustic soda.

37 lbs. C. M. White Oze.-----at 13 cts.

37 lbs. Wm. " "-----" 12 cts.

38 lbs. SS " "-----" 14 cts.

38 lbs. Yellow "-----" 11 cts.

AMERICAN WAX & PAPER CO.

928

T. EATON CO.

Nov. 9th, '95.

Toronto,

Canada.

300 E with mach.

**"Defendant's Exhibit, Fargo Original
Memorandum."**

100 lbs St. Acid.

15 lbs Aqu in steam kettle, add 22 lbs SS and heat slowly so it will not thicken up, when all dissolved add 1 lb Greenbanks 98% Scau and when this mixt boils add A. Brz (6 in diam x 1 inch deep should say 10 oz.) (Mr. Mac says 1 to 300 but think he is off) 930
When this is added it should be slowly as it foams a great deal but after it is done it will settle down to a clear liquid which should be carefully filtered through a muslin bag on inside and a drilling bag on outside. This liquor can be mixed by running a steam pipe into the kettle and etc. Add this to Stear and this must be slowly, then when done foaming add white ceresine 20 lbs (12½ cts) (A. W. & P. Co.) and cook till ready
55 lbs to 300 20 lbs Powder bought Storms
says will last ten days. 931

62--S. A.

4—37½ }
¼ Pure Met. Al. }
17 32 SS last
12 W. C.

51 S. A. }
11 37½ } 22 oz 37½
⅞ Salt } 1 oz Kero
11 Par } 1½ oz Salt

932

55 S. A.

½ Salt
3½—35
15—32 Carbonate

933

**"Defendant's Exhibit, Macdonald
Memorandum."**

AMERICAN GRAPHOPHONE COMPANY

Factory : Bridgeport, Conn.

T. H. Macdonald, Manager.

934

**FORMULA FOR MAKING HARD WAX CYLINDERS FOR THE
GRAPHOPHONE.**

24 lbs. best Stearine. (brand used was "AA", purchased from A. G. Belden & Co., N. Y. Melt the Stearine in porcelain lined kettle. Raise to a temperature of about 350 deg. F. Then add 3 lbs. Caustic Soda. Add the soda slowly, stirring vigorously. After the soda has fully united with the Stearine, which will take a little time, we have Stearic Soap. To

935

this then add 12 lbs Black Ozokerite. The Ozokerite must first be boiled at a temperature of about 375 deg. F. for 18 or 20 hours. This is necessary to drive off the volatile oils which it contains. Add the Ozokerite in a melted state, stirring well. When mixed 3 lbs. of Acetate of Lead (Sugar of Lead) should be added. This will cause some foaming, but the mixture will soon settle and become quite free from all bubbles. Keep at a temperature of 375 deg. F. for five hours, and then pour into thin shallow pans and allow to cool over night. It is ready to mold.

936

The above is same as sample "A" To make sample "AA", use half the quantity of Black Ozokerite.

"Defendant's Exhibit, Dodge Affidavit."

UNITED STATES CIRCUIT COURT,

DISTRICT OF NEW JERSEY.

AMERICAN GRAPHOPHONE COMPANY,

VS.

THE UNITED STATES PHONOGRAPH CO.
ET AL.

In Equity. 938

AFFIDAVIT OF EBEN G. DODGE.

STATE OF NEW YORK, }
County of New York. } ss.:EBEN G. DODGE, being duly sworn, deposes and says 939
as follows:

I am a resident of Orange, N. J., and am employed at the Edison Phonograph Works at said Orange. I have been so employed since about the middle of September 1894.

I have been familiar with phonographs and graphophones, generally, since about January 1889. At this time I was in the employ of the American Graphophone Company, the complainant herein, and remained in this employ until August 1889. I then entered the employ 940 of the International Graphophone Company, and in their interest attended the Paris Exposition until November of said year. From early in the year 1890, until some time during the summer of that year, I was employed as expert by the Eastern Pennsylvania Phonograph Company at Philadelphia. From the summer of 1890, until November of that year, I was employed at the works of the Edison Phonograph Company at Orange, N. J., my duties there being the assembling of the various parts of phonographs. Thereafter, for

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about two years, I was employed as superintendent of the New York Phonograph Company, being located in New York City and having charge of the business of the Company at that place. Thereafter—that is to say, in the month of November 1892, I was again employed by the American Graphophone Company at Washington in the capacity of salesman. I remained in this employ about one month, and then went to Bridgeport in the same employ, for the purpose of

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carrying on experimental work at the factory of the Graphophone Company at that place. In January 1893, while still in the employ of said Graphophone Company, I took charge of the branch office of that Company in New York, and remained in this position until April 12, 1893, having charge of the introduction of graphophones in the said city of New York. From April 12, 1893 until some time in May 1894, I was again engaged at the Bridgeport factory of the American Graphophone Company in the way of experimenting upon cylinders for use in connection with the graphophone.

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At the time that I commenced my experiments at Bridgeport on graphophone cylinders—that is to say, on or about April 12, 1893, the American Graphophone Company had in use and on sale a single type of cylinder for the recording and reproduction of sound. This cylinder was composed of a paper tube, coated with a thin, flexible and soft layer of ozokerite wax. In some instances this wax contained an admixture of paraffine.

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The graphophone in connection with which these cylinders were used were found decidedly objectionable by users for various reasons, among which were, that the wax with which the paper tube was coated was quite soft, and owing to this the point of the recording style was dulled, probably from impurities in the ozokerite; and that also, owing to the use of the soft wax, the material was not cut sharply from the groove, but was permitted to tear, under the action of the style, whereby the record groove was made rough, and this conducted to a confusion of the articulate sounds. Added

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to this the material clogged up the style, thus increasing the confusion of the sounds. Another objection, and one found very important in the use of these cylinders, was that owing to the softness of the material, the minute elevations and depressions in the sound groove were readily leveled off by the action of the reproducer passing thereover; that is to say, the material did not have sufficient stiffness to withstand the rubbing action of the reproducer as it passed through the groove for the purpose of reproducing sound from the record therein. Furthermore, with these cylinders it was impossible to record and intelligibly reproduce the hissing sounds so common in speech. These objections were well recognized and understood at the time I refer to, and experiments were carried on continuously for the purpose of avoiding them. 946

As an expert in this art, I devoted a considerable time to the study of these objections, and to considering various modes of improving the apparatus having the said objections in view, and to this end I was sent by the Graphophone Company to its Bridgeport factory, where I conducted a line of experiments in connection with wax cylinders, which led eventually to the soft cylinders or ozokerite cylinders above referred to being discarded and superseded by heavier cylinders composed of very much harder material, consisting principally of metallic soap. Previous to the time that I took up this work, however, the experiments had been carried on by Thomas H. MacDonald, the factory manager and superintendent of the Graphophone Company, at its Bridgeport factory. Mr. MacDonald had the same theory that I had concerning the improvement of the graphophone so as to avoid the difficulties above mentioned; indeed, Mr. Easton, who was made general manager of the company on or about the first of May 1893, also recognized the fact that the soft cylinders were decidedly impracticable, because, very shortly after his assuming that position, he, to a great extent, 947 948

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caused these soft cylinders to be discarded, employing in their places hard phonograph cylinders purchased by him, I understood from the Edison Phonograph Works for the use of the Columbia Phonograph Company, of which said Easton was at that time president. At the present time, according to my information and belief, very few, if any, of the soft ozokerite wax cylinders are being placed upon the market by the Graphophone Company. The phonograph cylinders, that is to say, cylinders made by the Edison Phonograph Works for use upon phonographs, and hard metallic soap cylinders, the manufacture of which has comparatively recently been taken up by the Graphophone Company, have almost, if not entirely superseded the said ozokerite cylinders.

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The hard cylinders referred to as being made by the Graphophone Company are of two types, but made of the same composition. One of these, known as the "P-cylinder", is in appearance the exact counterpart of the cylinder manufactured by the Edison Phonograph Works. Indeed, immediately after their construction, it would be difficult, if not impossible, to tell one of these "P-cylinders" from an Edison cylinder without testing them on a machine. Like the latter, the Graphophone Company cylinder is of metallic soap, it is of the same dimensions, and it is even provided with the internal screw-thread peculiar to the Edison cylinder.

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The other type manufactured by the Graphophone Company is also of metallic soap. It is longer and considerably thicker to permit it to be shaved down to remove a record. It is mounted upon a pasteboard tube, which gives it somewhat the appearance of the old ozokerite cylinder. This tube, however, is not coated with the material but, on the contrary, the material is moulded in a die, and the tube, after being provided with an external coating of shellac, is placed within the moulded cylinder. It was found necessary to do this for the following reason: It is absolutely impossible to mould the recording surface upon a

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pasteboard tube, owing to the expansion and contraction of the former being considerably greater than that of the said tube. That is to say, were a coating of wax or metallic soap moulded upon the pasteboard tube the contraction of such material would be so much in excess of the contraction of the tube that the surface of the material would crack, while if the recording material were considerably thicker the differing coefficients of expansion would cause either the cylinder to crack or else the internal pasteboard tube to wrinkle or buckle. 954

I have before me one of the cylinders last referred to, and for the purpose of identification have marked the same "Defendant's Exhibit Graphophone Cylinder E. G. D." During the process of moulding the exhibit cylinder, it is provided upon its interior with a screw-thread of great pitch, and when the paper tube is inserted it is secured by means of the shellac to this thread, which forms internal ribs. The object of this mode of attachment is to guard against the cracking of the cylinders. If 955 the cylinder had a continuous bearing upon the exterior of the paper tube throughout its length, the contraction of the wax or soap, which is infinitely greater than that of the paper, would cause the cylinder to crack; whereas, by reason of the bearing surface of the said cylinder under the paper tube being in form of a screw-thread of great pitch, provision is made for the contraction of that portion of the cylinder opposite one of the internal threads or ribs. Even this provision is practicable only to a certain extent, for these cylinders, 956 which average three-eighths of an inch, and are adapted to be shaved down, will only remain intact after being reduced one-half. After such reduction in size, the cylinder has not sufficient stability to withstand temperature changes and the wear incident to its use. This is true not only where the cylinder has, after use, been reduced in size, but applies equally where the cylinder is originally turned down to the reduced size. In addition to the objections which I have heretofore stated in connection with these two types of hard

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cylinders, it was found that shortly after being molded and turned down, a bluish-white incrustation, resembling mould, appeared upon the surface, and the longer the cylinders stood before being used the greater became this mould or incrustation. This was found very objectionable by users, especially in connection with cylinders on which records were made which were designed to be permanent, for the mould would form in the record grooves and in reproducing the record this

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conducted to confusion of the sounds and the production of scratching noises. This objection, too, was fully recognized by the Graphophone Company, and particularly by its manager E. D. Easton. It was one of the causes which in May 1894, induced the Graphophone Company to discontinue the manufacture of cylinders. Prior to this, however, every effort was made to avoid the difficulty. During the early experiments the Graphophone Company even went so far as to purchase from the

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United States Phonograph Company a quantity of fragments of phonograph cylinders of metallic soap (known as "scrap wax"), made by the Edison Company, and this was melted down at the Bridgeport factory and remoulded into new cylinders. It was found that the cylinders made from this Edison Company material did not have the objectionable feature of incrustation referred to.

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The manufacture of cylinders, like the hard types referred to, was commenced sometime in the fall of 1893, and continued to some extent up to the time I left the Graphophone Company in May, 1894.

I do not wish it to be understood that these hard cylinders were manufactured in any large quantities by the Graphophone Company, for this is not the case. In fact, the manufacture of these cylinders initially was experimental, and after such experimental construction they were manufactured only to a limited extent. Many more "P-cylinders" were made than "E cylinders."

The changes in the graphophone cylinders oc-

casioned corresponding changes in recorders and reproducers employed in that connection. With the old ozokerite cylinders, a steel recorder and an ordinary metallic pointed reproducer had been employed. In the spring or summer of 1892, the Graphophone Company put out a few machines having a bar or "slab" recorder of sapphire. Both of these types of recorders were found objectionable, not only because they con-⁹⁶¹duced to what is known as "chattering" but also because they were readily worn down and dulled by the impurities in the recording material. Therefore, after discarding the soft wax cylinders and employing the harder material, above referred to, the Graphophone Company placed upon the market machines employing recorders and reproducers which were the exact counterparts of those theretofore employed in the Edison phonograph, that is to say, they provided each of their machines with a recorder having a circular cutting edge and known as the "cup-recorder", and a spherical reproducer known as the "ball-point", both re-⁹⁶²recorder and reproducer being of sapphire or other precious stone. These Edison recorders and reproducers used in connection with a hard recording composition first employed by the Edison interests, gave the Graphophone Company the first glimpse of commercial success. Before this time, the graphophone was incapable of practical use. Its usefulness increased in proportion as it drew to it those features of the phonograph which had made the latter a business suc-⁹⁶³cess.

Now, as to the extent to which graphophones and phonographs have been in use. By reason of my connection with both interests, as I have heretofore set forth, I am enabled to testify to these facts from my personal knowledge. Previous to the time that the Graphophone Company employed phonograph blanks upon its graphophones (this being in May, 1893), it had been totally unable to place upon the market a commercially successful machine. Prior to this time, but a very limited number of graphophones had been⁹⁶⁴

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sold. A considerable number of them were put in experimental use, but were decidedly unsatisfactory, because they did not meet the requirements. Indeed, after May, 1893, the graphophones placed upon the market even with the *phonograph blanks*, were still unsatisfactory, for the reason that the corresponding changes had not been made in the mechanism to permit said blanks to be employed, and it was not until the latter part of the summer of 1893 that the grapho-

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phone was so far modified as to make the use of these phonograph blanks practicable. It is true, however, that a few of the exhibition graphophones which were adapted to be operated by means of a coin acting upon certain releasing mechanism were changed before the commercial machines; that is to say, shortly after May, 1893. The changes made in the commercial graphophones to adapt them to use the phonograph blanks consisted as I have said in replacing the old recorders and reproducers with those forms now in use, these consisting of the recording style of sapphire and cup-shape, and the reproducer being also of sapphire and having a ball-point. These forms were adapted from the phonographs then in use and placed upon the market by the North American Phonograph Company.

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The commercial success of the graphophone, if it has had any, dates from the time when these changes were made. I am, of course, unable to testify upon my own personal knowledge of the extent of use of these graphophones, that is to say, the actual number employed, but, from the daily contact which I have had

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with people who make use of sound recording and reproducing machines, I have no hesitation in saying that there are to-day a far greater number of phonographs actually in daily use than there are graphophones. The phonograph is decidedly the more practicable machine of the two, notwithstanding the adoption by the graphophone of the important features taken from the phonograph, and this is fully recognized by users who have had occasion to compare both devices. During the period that I represented the

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Graphophone Company, both in New York and Washington, although I daily attempted to make sales of graphophones, I was wholly unable to do so, and my failure to make these sales I attribute to the fact that the machine was impracticable, and would not answer the purpose for which it was designed.

(Signed) EBEN G. DODGE.

Sworn to and subscribed before me this 27th day of November, 1894.

970

(Signed) EUGENE CONRAD,
(SEAL) Notary Public
Kings & N. Y. Counties.

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**"Defendant's Exhibit—Selected Portions of
Macdonald-Melzer Correspondence."**

Macdonald to Melzer—Jan. 8, 1895.

BRIDGEPORT, CONN., 1/8/95.

MESSRS. A. & C. MELZER,
Evansville, Ind.

974

GENTLEMEN: I telegraphed you this morning in regard to the oxide of alumina, and this afternoon received your answer. I was in New York yesterday and ordered from E. Merck & Co. some of the Hydrate of Alumina. I had previously written the Philadelphia people you suggested, but had not received a reply, as yet. Merck gave me the oxide and stated that it was the same thing. On looking up the formula to-day, however, I found that the oxide was Al_2O_3 and that
975 of the hydrate was $\text{Al}_2(\text{HO})_6$. This addition of three parts of water in the hydrate struck me as being of consequence in determining the weight to be used, and hence the telegram.

I am more than glad to hear you say that you have a better composition still, though to tell the truth I think that the present one will be pretty hard to improve upon. It seems to me, the more that I use it, that it is about as good as could be hoped for. Still, you have done so well with the mixture, and with such imperfect
976 data to work upon, that I would not be at all surprised to know that you have made still further advance.

I have one batch of 200 pounds in process of completion now. This was started before I received your telegram. I have received orders for a thousand cylinders on the strength of fifty similar to those I sent you that I had submitted our record making department in Washington. They think as I do that they are good enough.

While in New York yesterday I gave directions to the house that makes our cabinets for a special parlor.

977

cabinet for your machine. As soon as it is done I will take pleasure in sending it forward.

I inclose a memorandum that should have gone with the box of cylinders sent you last week. It was inadvertently omitted by the packer.

I hope that you are having no trouble with the machine. If anything is needed, please let me know and I will see that it is attended to at once.

Awaiting your esteemed letter, I remain,

Yours truly,

978

T. H. MACDONALD.

Melzer to Macdonald—Jan. 9, 1895.

A. MELZER,

Fine Toilet Soaps,

979

EVANSVILLE, IND. Jany 9th, 1895.

DEAR MR. MACDONALD: Answering your telegram of yesterday, we now beg to say that Hydrate of Aluminum, is primarily the voluminous precipitate which is thrown down when treating a solution of Alum with an alkali, usually Carb. of Soda. After the water is *evaporated* from this precipitate, it is still a hydrate, or hydrated oxide, but if then subjected to a high heat (calcined) and thereby reduced to an anhydrous state, 980 it becomes Oxide of Aluminum. We prefer the Hydrate or hydrated Oxide to the Anhydrous Oxide, because as a rule, the metals are more soluble in the former form. Small glass jar we sent you today, contains Hydrate of Aluminum made by ourselves. When we found that it is the material we should want for Comp. we ordered $\frac{1}{2}$ lb. from St. Louis, as it is too much trouble to make in a small way. We ordered the Hydrate, but package was labeled Oxide, without any explanation from sender and as we found it to

981

work equally as well as that we had prepared we paid no further attention. We next wished to obtain the Alumina at a more reasonable price, and wrote to the Penna. Salt Mfg. Co. Philadelphia, explaining to them the form in which we preferred it, and enclose their answer; suffice it to say that the Hydrate we prepared ourselves, the Oxide from St. Louis and the "Hydrate or Oxide of Alumina" from the Penna Salt Mfg. Co. all worked equally well and hence we answered
982 your telegram "Oxide will do". After receipt of small sample from Philadelphia we subsequently ordered a 5 lb pkge. We sent you a part of this with recipe, and to-day send you the rest, excepting a small quantity we might want for further experiments.

When we rec'd your telegram, we had just obtained results from a new line of experiments which we believed had produced a superior composition and hence we requested you to suspend work until you heard from us. We now regret to say that it was a
983 delusion. Our wish was to make the Comp. more resisting, tougher, but not gummy, and we believed at the time that we had accomplished this by the addition of a small percent of glycerine; this *does* remove the brittleness, but we have since found that this advantage is offset by disadvantages and we must now add the glycerine chapter to our big book of failures.

Soon after receipt of telegram, the Expressman brought the 2 bxs. of Cylinders; we opened the small one first and we can assure you it is a long time since
984 anything gave us so much pleasure as your note and the two Cylinders you made according to our recipe. In the large box we found more specimens made from our Comp. than we had expected, and for which please accept our best thanks; we tried the cylinders after supper and if they had not been made from our Comp. we should say they are as good as the best made up to this time; that is, so far as our knowledge goes from hearing a phonograph occasionally. When we heard "Lonzo" sing "Lindy do you lub me?", this writer who will soon celebrate his 50th birthday anniversary,

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got down on the carpet and turned 3 somersaults. We would not sell that cylinder for \$10.00. "Casey in Court," and in fact, all the rest are equally good, excepting here and there a high and strong note as occur in the "Blue Danube" Waltz and in "Au Revoir".

We also found in large box, a lot of cylinder fragments, but no instructions regarding them, and a piece of Comp. marked "Jany 4th 1895", which latter is undoubtedly a piece of the first batch you made according to our recipe. We were glad you sent this and also a sample of that "Adamantine Stock" so we can examine same. The "Adamantine Stock" is softer than our Stearic acid with 5% Paraffine wax would be and in consequence your Comp. is likewise a little softer, but this is not necessarily a disadvantage. Your composition is crystalline in center and it very frequently turns out that way when we make it. You would hardly believe all what we have tried to prevent this, without having succeeded so far. It will not crystalize when left to cool in a small or thin body, and we presume comp. which is crystalline in centre of large cakes, will cause no trouble when worked up into cylinders. What is your experience in this?

We send you by Adams Exp. today, a small sample made from "Adamantine Stock" according to proportions in our last. This is composed of

60 parts "Adamantine Stock"	} Marked T	988
6 " Ozokerite		
$\frac{3}{4}$ " Alumina dissolved in		
12 " 37 $\frac{1}{2}$ ° Lye		

You will notice we have slightly reduced the proportion of the Alumina in accordance with the suggestions in our last. We think this will suit you in color, which however, you can vary by changing proportion of ozokerite. The comp. will also get darker by continued boiling.

We will make further experiments, and if we find

282

Defendant's Exhibits.

989

anything to your advantage, will communicate same at once.

Very Respy.

(Signed) A & C MELZER.

A.

We also beg to acknowledge receipt of a large tablet of ozokerite.

990

Melzer to Macdonald—Jan. 10, 1895.

A. MELZER,

Fine Toilet Soaps.

991

EVANSVILLE, Ind. Jany. 10, 1895.

DEAR MR. MACDONALD: We send you by Adams Exp. today, 3 specimens, showing final results of tests made with "Adamantine Stock" and your Comp. marked "Jany. 4th, 1895."

Specimen marked "Mc 1" is 4 oz. of your comp. dissolved in cup; nothing else whatever done to it. You will see it is quite crystalline in center.

992 Specimen marked "Mc 11", is 4 oz. of your comp. which was subjected to quite a number of manipulations for purpose of ascertaining cause of crystallinity, before we struck the right and most probable cause, which we as much as predicted in our letter of the 6th inst. This specimen as you now see it, is your comp. with an addition of $\frac{1}{7}$ (one-seventh) ounce "Adamantine stock" to the 4 ozs. of Comp. which would go to show that the "Adamantine Stock" contains more than 5% Paraffine wax. The dark color of this specimen is entirely due to the oft repeated reboilings.

Specimen marked " U " is composed of

993

61 parts " Adamantine Stock ".
6 " Paraffine Wax.
 $\frac{7}{8}$ " Alumina dissolved in
12 " $37\frac{1}{2}^{\circ}$ Lye.

These are the right proportions for Compo. from " Adamantine Stock " which please verify by making a sample at your end in accordance with above. We 994
also send you a sample of the Stearic Acid we have been using in which we dissolved exactly 5% Paraffine wax ; we think you will find this considerable harder than " Adamantine Stock ".

You will be apt to have trouble with crystalline compo. when you change the lye or stearic acid and you will have to find out the new proportions by careful tests like those we have just made. To obviate necessity of making these tests often, it will be well that you prepare enough lye at one time to last 995
some time and keep it well cooled, also buy a fairly large quantity one kind stearic acid and aluminum oxide ; (if possible, get this latter from the Penna. Salt Mfg. Co.).

If you do not succeed with these tests and establishment of proportions, and will send us a few pounds of your stea. acid, a couple of ounces of your alumina and a pint of your lye, we will make the tests for you.

Hoping this will reach you in time to insure nice non-crystalline compo. we remain with best wishes— 996

Very Respfy.

(Signed) A. & C. MELZER

A.

997

Macdonald to Melzer—Jan. 18, 1895.

"JAN. 18, 1895.

MY DEAR MESSRS. MELZER : Pardon my delay in replying to your esteemed favors of recent date. I have been kept very busy lately, and have hardly had time to think.

- 998 Now in regard to the cylinder mixture, I am not having quite as good success as you did. Of course this could hardly be expected. I inclose a report received from our musical record maker in Washington. These cylinders were all my own attempts to make the "f", "g", "h", "l", and "m". As you note he complains of too much "grease". By this he means that the mixture is too gummy. I have found this difficulty in all my attempts. That is I have had hard work to get them dry enough without
- 999 making them too hard. I have not yet succeeded in getting as good results as those you have sent, I have, lately, a strong suspicion that the stearic acid I have is responsible for the difficulty. It seems that it is of too oily a nature. The piece you sent was much harder, and contained, apparently, much less oily substance.

- Can you have a barrel of the same stearic acid, sent us by Express, that you used? If you will kindly forward an order to the Firm and have them send us the same brand, we will be greatly obliged. They may
- 1000 send C. O. D. I am preparing a box to send you by freight containing several samples of all the material used by me.

I also have a great deal of difficulty with the crystallization. In many samples I have found this disappear on raising the temperature up to 180 to 185 C. Sometimes it appears only in the centre and sometimes it occurs all through the mass. I send several marked samples in box.

I have received 100 lbs. of hydrate of alumina from the Penn. Salt Mfg. Co. It appears to be exactly like

1001

that sent by you. I send sample of this. I send you also a bottle of the Lye I have been using. It is made from water of condensation of steam.

I now have a large batch of sample "T" in the pot. This seemed to turn out the best with me of anything that I have made. I have also about 50 lbs. of "u" in process of completion. Will send samples of both in box. The scented samples are very nice. I think that this would be quite an addition to the mixture.

1002

I beg to acknowledge receipt of both boxes of small samples, bottle of oxide and paper of hydrate of alumina.

I have succeeded in getting some Ozokerite of a better grade than the last I sent you. I also send you some refined yellow and refined white Ozokerite.

I feel, however, that I am on the right track and that I will soon acquire the cunning that will produce a good cylinder.

1003

I feel confident of the composition being all right.

Very truly yours,

T. H. MACDONALD."

Macdonald to Melzer—Jan. 25, 1895.

" BRIDGEPORT, CONN., 1/25/95. 1004

A. & C. Melzer,
Evansville, Ind.

GENTLEMEN :—I telegraphed you to-day, " Will bring molds, shaving machine, reamer, samples, and records with me." As I wrote you I expect to go to Chicago very soon. In fact as soon as I can have made the above mentioned cylinder apparatus I will start. It will take fully a week to get them all properly working. Will bring two moulds, for cylinders.

1005

These will allow a cylinder to be made about every 5 minutes.

I fully realize that you have labored under great disadvantages in your experiments, and the knowledge of this fact but increases my admiration for the very excellent work you have thus far done. However, you shall be supplied now with everything that you may require. I have been driven so hard lately that it is not a wonder that some things are neglected.

1006

I have the entire work of the factory to look out for, as well as the experimental work, and it keeps me moving.

I send you by this mail a photo. of our factory.

I inclose to-day another report from Mr. Child on cylinders sent since the first report was made. Our Chicago agency at 98 Madison St. report that the cylinders are all right, and have ordered 6 more barrels to be sent immediately, (150 in a bbl.)

1007

I inclose three reports received from Mr. Child in Washington. In the first, marked report (B) he gives his opinion of two cylinders made from your composition. This was your composition "h" No. 3, to which he refers, was not your mixture, it was about the same as the samples originally sent you last summer.

Those mentioned in report (C) were made of Adamantine Stock and in proportion of

1008

60 lbs. Adam. Stock,

8 " Ozokerite,

$\frac{7}{8}$ " Hydr. Alumina in

11 " $37\frac{1}{2}^{\circ}$ Lye, made from Greenbanks
98% powdered.

The Hydrate of Alumina was purchased from the Penn. Salt Mfg. Co.

Those mentioned in report "D" are the same except that paraffine was used instead of Ozokerite.

I have made a batch of 250 lbs. according to formula "U" sent last. I send samples of this to-day.

I did not start the box as I intended doing, and as I wrote you, for the reason that I had hoped to go there

1009

next week. But now as I have decided to fit up a turning machine, reamer, moulds, etc., for you I will wait till they are done and will take them along. So, not to delay your receipt of the samples longer, I send you by express, prepaid, a barrel containing the following:—

Quantity of Adamantine Stock Stearic Acid, (This is in large irregular masses).

Quantity Pure Stearic Acid in small cakes of about $\frac{1}{2}$ lb. each. This is sold us under guarantee that it is 1010 pure material by A. G. Belden & Co., N. Y.

Sample No. 1 "U" mixture. This was made in small lot and shows no crystallization. Seems all right.

Sample No. 2 is the same "U" mixture. In this

"U" Formula. 61 lbs. Adam. Stock 6 lbs. Paraffin $\frac{7}{8}$ lbs. Hydr. AL. in 12 lbs. Lye, $37\frac{1}{2}^{\circ}$.	crystallization shows. This is part of 250 lb. lot and that is only difference from No. 1. I endeavored to the closest point to make this in exactly 1011 the same proportions as No. 1.
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Sample No. 3 from a small batch made exactly like above except that paraffin is omitted. It seems to be better for our purpose.

Sample No. 4 is a "T" mixture, made in small lot. It is good as far as we can see. The records are good, and not a great deal of scratch.

I also send you a cake of White Ozokerite or Ceresin, and a cake of black which is guaranteed pure wax. 1012

In the barrel also I have placed a bottle of the Lye used, a piece of paraffin, 3 "T" blank cylinders, and a number of musical records.

Will leave here with outfit about Feb. 6, I think from present outlook.

Yours truly,
T. H. MACDONALD."

1013

Melzer to Macdonald—Jan. 25, 1895.

JANUARY 25TH, 1895.

MR. T. H. MACDONALD,

Bridgeport, Conn.

1014 DEAR SIR:—Your favor of the 22nd and telegram of this date are to hand. We will be very glad to have you come and stay with us as long as you please. If you go to Chicago first, then wire us from there on what train you will come, and we will meet you at the depot.

1015 We have sent you this morning by Adams Express, before receiving your telegram, a cake of composition which we intended to mark "Potpourri" but forgot to do so. This is a wonderful mixture, being composed of 27 Laboratory samples, which we have made within the past 2 weeks, and concluded to utilize by melting them all down into one body. It would be extremely difficult to figure out the composition of this potpourri, yet, if it should turn out either particularly good or bad, we would know the cause. Please work up into cylinders and give it a good test. There is no ozokerite in it.

Very respy.

(Signed) A & C MELZER.

1016

Melzer to Macdonald—Jan. 29, 1895.

A. MELZER,

Fine Toilet Soaps.

EVANSVILLE, IND. Jany 29th/95.

MR. T. H. MACDONALD,

Bridgeport, Conn.

DEAR SIR:—Your favor of the 25th came to hand yesterday and the bbl. of samples etc. was delivered to

1017

us just before noon to day. We unpacked it at once and found it to contain all that you mentioned in letter and in addition a piece of composition marked No. 12, which was a great surprise to us. You have never mentioned this compo. to us anywhere. According to proportions marked on this sample, viz :

14 Adamantine Stock

1 Caustic soda

$\frac{5}{16}$ Acetate of Aluminum

it is practically the same as recipes we have furnished 1018

you (will know exactly soon as we get time to figure the equivalents) but there is that very great difference, namely, like the acetate of lead compos., this No. 12 contains acetate of soda in a free state, which is bound to cause "sweating" in damp weather and an efflorescence in dry, but the quantity of this objectionable salt in No. 12 is not near so great as in your mixtures "E" & "D," and probably causes you no serious inconvenience. In place of the acetates, you might use the sulphates and would then produce sulphate of soda (Glauber's Salt) instead of acetate of soda; but the one would be as objectionable as the other. The only proper form, is the oxides, and as most of the oxides are insoluble in water, fat or alkaline solutions, the Hydrates, Hydrated Oxides or Hydro-oxides are used. Caustic soda is the Hydroxide of Sodium. It is quite interesting to note how two persons independently and unbeknown to one another, so nearly obtain the same results, and as "misery loves company" we will hope that the other fellow travelled over just as long and rough a road as we did to "get there." Another great difference between No. 12 and our compos. is that, in making it, dry caustic soda is used in place of soda in water, without water, the combination cannot be near so perfect and there would be nothing in which to solve the Hydrate or Oxide of Aluminum.

1019

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We were very anxious to see samples of comp. you made, and find No. 1 and 3 as good as we could make them. They are the same as you say, except that No.

1895.

S, 1895.

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1 contains more paraffine wax. As stated in former letters, the quantity of paraffine used, does not effect the compo. in any way, except that it makes it softer and as you would say "gummier" in proportion to quantity taken. Paraffine, like coal oil is a hydro carbon and cannot be saponified, *i. e.* will not combine with an alkali to form soap, and hence in figuring the proportions of lye for the composition, it is only the stearic acid which is considered ; more or less paraffine

1022

does not effect the figures.

No. 2 as stated in your letter, is crystalline. If you have used the $37\frac{1}{2}^{\circ}$ Lye we sent you for making No. 1 & 3, and used *your* $37\frac{1}{2}^{\circ}$ Lye for No. 2, then we can easily account for the crystalinity of No. 2, in that, your lye is made from purer soda, and the same quantity will go farther than the lye we sent you. We at once made two tests and send results by Adams Exp. today.

1023

Mac IV is 50 parts your sample No. 2, to which we added 1 part water and kept it on the fire at 150-160 C for about an hour and until all foam had disappeared. You will see it is just a trifle crystalline in center.

1024

Mac III is 50 parts your sample No. 2 to which we added 1 part Stearic Acid and 1 part water and worked same as Mac IV. You will see this is all right. Now to fix up your 250 lb. batch of No. 2 proceed as follows. Melt it in your kettle and keep at a temperature of 130 to 140° C *without stirring it*, for an hour or two, and let it stand until next day. The object of this is to give the dirt that is in it a chance to settle out. When solidified, take from kettle and carefully scrape all the outside and carefully clean the kettle, then break up the compo. and re-melt, adding to the 250 lbs. of comp, 5 lbs. stearic acid or Adamantine Stock and 5 to 10 lbs. of water ; keep at 150° to 160° C until all foam has disappeared, and comp. will be all right.

In one of the reports you sent us, we note Mr. Child complains of a whistling noise which is same trouble we discovered in first of your cylinders you sent

856

1025

us. We are at a loss to account for this, as we do not hear it in cylinders from comp. we made according to same formula. We would not be sure, but are inclined to the opinion that your people are not sufficiently careful to keep out of comp. all extraneous matter. Our father used to say: "A soap factory must be kept so clean, that when you drop your buttered bread on the floor, (it always falls buttered side down you know) you can pick it up and eat it without hesitation." During his lifetime, the floors of our factory were nearly that clean, but they are hardly that way now; still we fully recognize the importance of pure materials and a clean factory, and particularly in making cylinder material, too much care in this respect cannot be taken. The comp. ought to be kept in fluid state 24 hours, and you would be astonished at the quantity of dirt at the bottom.

1026

We do not return reports herewith, as we have not had time to study them sufficiently nor have we examined materials & cylinders you kindly sent us, for which thanks very much.

1027

Respy.

(Signed)

A. & C. MELZER.

A.

1028

Macdonald to Melzer—Jan. 31, 1895.

"BRIDGEPORT, Jan. 31, 95.

MY DEAR MESSRS. MELZER: Your esteemed favor received, also the sample "potpourri," I have made several cylinders of this and will bring some samples with me. I do not think it presents any advantages over your other mixtures. It evidently contains carnauba wax.

I have received the package of Stearic Acid from

1029

Schneider & Co., Chicago. I find it vastly superior to that which I have here. It seems dryer, harder, and of a better "grain." The mixtures that I have made with it show up much better also.

I have a shaving machine, 2 moulds, and a reamer in shape for you, and hereafter you will be able to work more easily and with more certainty.

I will start from here on Wednesday next, and will go direct to Evansville. Will telegraph the train on which I will arrive on Thursday. Will send everything along so that we will have no delay there.

Hoping to see you soon, I remain,

Very truly yours,

T. H. MACDONALD.

1031 **Melzer to Macdonald—Jan. 31, 1895.**

"EVANSVILLE, Ind. Jan. 31, 1895.

MR. T. H. MACDONALD,
Bridgeport, Conn.

DEAR SIR :—Since our last, we have again carefully read your letter of the 25th and studied the 3 reports from Mr. Childs.

We now see that, the cylinders reported upon in reports C & D. and about which complaint is made that they are too soft and also "noisy" were made from Composition composed of

60 "Adamantine Stock"

8 Ozokerite or Paraffin

$\frac{7}{8}$ Alumina in

11—37 $\frac{1}{2}$ deg. Lye

This is quite a change from the "U" formula of

61 "Adamantine Stock"

6 Paraffin

$\frac{7}{8}$ Alumina in

12—37 $\frac{1}{2}$ deg. Lye

1033

and we did not know how to explain that you succeeded in making the Comp. with so little lye, as the difference in Alkaline strength between the lyes of same gravity, one made from 76% and the other from 74% Caustic Soda would not amount to 8%. We made some figures and found these results :

37½ deg. Lye from C. P. Caustic Soda, contains 31.85
Na H O

Then

37½ deg. Lye from 76% Caustic Soda contains 31.23 1034
Na H O

37½ deg. Lye from 74% Caustic Soda contains 30.41
Na H O

37½ deg. Lye from 72% Caustic Soda contains 29.59
Na H O &c. &c.

Now, then, if you used 11 parts of 37½ deg. Lye from 76% Caustic Soda to 60 parts "Adamantine Stock", each part of "Adamantine Stock" or rather the Stearic Acid in that "Adamantine Stock" absorbed 0.057255 parts Na H. O. In our 1035
"U" formula, 61 parts of "Adamantine Stock" receive 12 parts 37½ deg. Lye from 74% Caustic Soda, and hence each part "A. Stock" receives 0.059823 parts Na H. O. As the limits between minimum and maximum of lye are very narrow, as stated repeatedly in our former letters, we knew of no way to account for this considerable difference between 0.057255 & 0.059823, except that our Caustic Soda, bought for 74%, is probably only 72% or less ; this looked plausible, and in fact, many Soap Makers will not buy 1036
higher test soda than 70 & 72%, because they say that they have found in practice that they got the same thing when they buy 70% or 74%. As this article is now very cheap, (about 2½c. lb. for 74%), it does not pay to analyse and "kick" about a shortage of 1 or 2%, besides there is a difference in the strength of the contents of nearly every drum of the same lot.

Notwithstanding the above plausible explanation, we did not feel quite satisfied, but next figured up com-

1037

position of your sample marked No. 12, which you say thereon is made of

14 lbs. Adamantine Stock,
1 lb. Greenbanks Caustic Soda,
5 oz. Acetate of Aluminum.

Reducing this to ounces, which we will call parts, we have :

244 Adamantine Stock,
16 76% Caustic Soda,

1038 5 Acetate of Aluminum.

The last item is composed of 3,75 Acetic Acid and 1,25 Aluminum Oxide, which gives 1 part Al. Oxide in 179 parts Adamantine Stock or less than half the quantity we have been using. Now, let us look at the amount of Alkali. The 3,75 parts Acetic Acid neutralize 2,50 parts Caustic Soda and form therewith 5,12 parts Acetate of Soda, which Salt is held in your composition in the free state and causes it to "sweat" in damp weather, the same as the
1039 common salt on a ham and effloresce in dry weather. Deducting these 2,50 parts Caustic Soda which are neutralized by the 3,75 parts Acetic Acid, it leaves us 13,50 parts 76% Caustic Soda, equal to, 13,23870 parts c. p. Caustic Soda and dividing this figure by the 244 parts "Adamantine Stock" in the No. 12 Sample, has 0,059100 parts Na H O.

1040

We believed that $\frac{1}{8}$ parts Al. Oxide in 60 parts Stearic Acid is a small percent ; yet, if you will consult the little red book, you will find that we cautioned
you not to increase this quantity, but rather to decrease it, and in fact, we have since made a sample compo. with $\frac{1}{16}$ parts Al. Oxide in 65 parts Stearic Acid. However, as we could see no improvement in this compo. over the other, and since the Al. Oxide is cheap and hence no object apparently to reduce the proportion, we thought nothing of the matter and melted this sample down with the others into cake of "Potpourri."

After finding Composition of No. 12, we were

1041

curious to make a larger sample of same composition practically, and have used to this:

60 oz. *your* Adamantine Stock

3 oz. *your* Parafine Wax

$\frac{1}{8}$ oz. Alumina in

12 oz. *your* Lye.

Before beginning the operation, we carefully weighed your lye with the same hydrometer that we used in weighing the lye that we sent you, and to our surprise, we found it marked plump 38 deg. in place of $37\frac{1}{2}$ deg. 1042 upon which we based our figuring as per page 2, and which will account for a large part of the difference in Alkali mentioned. As you had made your Comp. with 11 parts of this 38 deg. lye we started with the same quantity, and dissolved in this the $\frac{1}{8}$ oz. alumina. In doing this, we placed the beaker between ourselves and the light, and in looking through it, the contents very much resembled a miniature aquarium filled with fishes, turtles and crabs; where all this dirt & stuff comes 1043 from, is a mystery, but a large part perhaps is in the Al. Oxide, which being a cheap commercial article, may not be handled particularly nice; another source, (producing flakes,) is probably due to the coloring matter in your lye, which very likely, is iron; at any rate, we did not pour the lye & alumina boiling hot, fishes and all, into the "Stock", but allowed it to settle, and by carefully decanting, kept out quite a little of the impurities, which had gone to the bottom. After boiling a while, we saw plainly, that more lye 1044 was required, and added $\frac{1}{2}$ oz; in proceeding, we saw that even with this addition, more lye was wanting, but having already used $\frac{1}{2}$ part more than yourself we concluded to take the risk and added no more. This morning when we examined the cake, we found it crystalline, through and through, that peculiar crystal indicating a lack of base. We now dissolved it again, adding $\frac{1}{2}$ oz. your lye in 1 oz. water, boiled it at temperature of 140-150 deg. C. until all foam had disappeared, and it is O. K. We send you this sample

1045

herewith, marked V. We believe you will find this sample better than any you have received from us before, also less brittle and breakable, and would request that you make up into cylinders and note carefully its characteristics, particularly, the "whistle" or "scratching" part. If you discover the least amount of this, then the trouble is with the Alumina, and we will look around and see if we cannot obtain a true Hydrate, Hydrated Oxide or Hydroxide (which all

1046

means the same thing) like that we made in our laboratory, and of which we sent you sample in glass jar. It will be no use to write to Pena Salt Co. or to Merck, these office people have no interest in our experiments, and as the prospects of selling 100 lbs. Hydrox. of Al. which they would have to make specially, is not sufficiently alluring to keep them awake o'nights, they simply tell us that the Hydrate & Oxide are the same thing. We too, believed that we got same results from using the hydrate and Oxide,

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but are now inclined to believe that the Coml. Oxide is impure and more or less insoluble, which may account for that "whistle".

In explaining how we managed to use 1 oz. or part more lye than you did, would say, that is accounted for by the difference in the quantity of Alumina, both are bases, and when one is reduced, the other must be correspondingly increased.

1048

This is a long epistle, but it will pay you to read it carefully; you will then know how to make the Alumina Comp. as well as we do, up to the present time; you will also know how *not* to make it, and what to do if matters go wrong. Some things however, cannot be explained on paper, you will see that when you come here.

We tried the new cylinders you sent us, last night; they are splendid, particularly the "Jolly Copper-smith" and Quadrille from "Ernani"; in fact all the records of Isslers Orchestra, are fine. Of what Compo. are these cylinders made?

We also found repaired recorder and that "curios-

1049

ity cylinder", which judging from quantity of water to be evaporated, is no "snap" to make. We have considered and tried all the substances stated on that formula, and in addition: Asphaltum, Glue, Gelatine, Dextrin, most metals, all the gums and waxes from "Araby the blessed" and many other, but they will not make cylinder Comp.

Please mail 3" or 4" of $\frac{3}{8}$ " tubing that connects the horn to 'phone. The piece that came with the machine, is rather too short.

1050

Very respectfully yours,

A. & C. MELZER

A.

MACDONALD.

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Macdonald to Melzer—Feb. 2, 1895.

1051

BRIDGEPORT, CONN.,

Feb. 2, 95.

MY DEAR MESFRS. MELZER,—Your package by Adams Express, and letters contained therein were received to-day. I have shipped you by freight a box containing a shaving down machine, 2 moulds, and a reamer. Inadvertently this box went forward without being prepaid. If you will kindly pay the freight on the same, I will reimburse you when I reach Evansville.

1052

Your notes were read with more than usual interest. Your reference to cleanliness was very timely, as the filtering is something that has been occupying a great deal of our attention. I filter the Stearic Acid through 10 thickness of shaker flannel, the Lye and Ozokerite, also the paraffin are then put through filter paper. After the mixture is complete I then put it through 15 thicknesses of cheese cloth. Even with this we

1053

have trouble with extraneous matter getting into the compound. The greatest objection to dirt or outside matter of any description is that it throws the recording styles out when making a record. Lint is one great enemy. A small piece frequently wraps itself around the point of the stylus and lifts it out, causing the recorder to thus "sled" along, making no record.

1054 We have, however, met with gratifying success with the mixture, indeed our Chicago agent, Mr. Douglass, states that it is fully equal to any cylinder that he has ever used. He has used about 1500 of them thus far.

1055 Mr. Child, our musical record director, has been with us for this past week and he states that the cylinder that we now have, is all right. This blank, to which he refers, is made from the Stearic Acid received from Schneider in Chicago, and which you ordered for us. This material is infinitely superior to the "Adamantine Stock" in the writer's opinion for our purpose. I have had scarcely any trouble with crystallization since I received it. The material is dryer without being too hard, and the "scratch" on reproducing is less.

In regard to the material which I sent you and which was made with Acetate of Alumina, it might be interesting to you to know how I worked up to the point where I was before I received your formula.

1056 When I first attempted to make a cylinder in 1893, I added some *Castile Soap* to Stearic Acid, and then hardened the mixture by adding litharge, or lead oxide. This gave an idea, nothing more. I next tried adding the lead directly to the Stearic Acid in a dry state, uniting all that the Stearic Acid would take up. This gave an exceedingly hard compound, but of little use for cylinder work. I then tried to saponify the mixture, but as a rule succeeded only indifferently well. I used water, and also added the Caustic Soda in a dry form. The greatest difficulty I experienced was the "gummy" character of the blank, and next they were very noisy. Also it was very difficult to

1057

mold them. As we had been making the paper Ozokerite cylinder, and had the Ozokerite handy, I tried tempering the blank with Ozo. I went through quite a long series of experiments in this line without much success.

After a long time I tried the Acetate of lead. This gave much better results as to texture of composition, and records. I then had made a number of Stearic Acid soaps both by adding the soda dry, and in water.

After working with this for quite a while, we 1058
thought we had a composition that was good enough, and started their manufacture. The result you know. Sweating destroyed the record entirely. I then began to try the other Acetates and about the middle of November last happened on acetate of Alumina, which with the exception of your comp. gave me the best results of anything I had yet tried. This was the "sour smelling" cylinder of which you spoke. The way has been long, also at times very weary. My training had not been in this line and I was therefore handicapped in the struggle. Well, I think it is past now, 1059
thanks to you, and hope that we will all enjoy the fruits of the successful blank.

Will see you next Thursday, and can then explain all matters more satisfactorily,

Sincerely yours,
T. H. MACDONALD."

1060

1061

Macdonald to Melzer—Feb. 24, 1895.

" FEB. 24, 95.

MY DEAR MESSRS. MELZER, I arrived home with about as severe a cold as I have ever had the misfortune to acquire. I have been able to go to the factory but twice and that for a few hours at a time. I feel a little improved today, and think that I will be able to take up the work again tomorrow.

1062

I received your telegram in reference to No. 129. The material and sample have not yet arrived, though. I found the sample I had with me pretty badly crystalline. On moulding however none appeared in the cylinder. I think a little more boil will be beneficial. I hardly think sufficient time was given to get all the water out.

1063

Of the mixture made here from liquor sent in carboy I find there is not quite as good results as we expected from our samples. The cylinders are more tenacious, and more "gummy". I note that seems to be a quality of this material, that the same proportions in a large batch seem to give a "gummier" and more tenacious material than when made in smaller lots.

1064

I found considerable trouble in regard to "pin-holes" in finished cylinders. This is a rather queer difficulty, and I found it from my former cylinders also. On the first moulding they do not appear. It is only when we melt up the shavings and overflows that we find them appearing. I have no doubt that we will be able to locate this trouble, though.

The material from Belden, N. Y. is here and I will commence a 300 lb. batch of that, tomorrow, —Monday.

I will write you further in a day or two. I desire again to express my deep sense of gratitude to you and to Mr. & Mrs Froelich for the many kindnesses I received during my recent visit and hoping that I shall have the opportunity to return the same in some measure, I remain,

Yours sincerely,

T. H. MACDONALD.

1065

Macdonald to Melzer—March 14, 1895.

"MARCH 14, 95.

MY DEAR MESSRS. MELZER: Your esteemed favor of recent date received. I inclose the voucher as you forgot to sign receipt at bottom of same. Will you kindly date and sign receipt at the bottom of the voucher?

I have been adding just what you suggest to the pot as the boiling proceeded, that is a small quantity of paraffin and Stearic Acid. I have had but little trouble with "pinholes" since we began the molding at 160° C. and added the above. 1066

The music folks think that our cylinder is full as good as the other except that they want it "dryer" they say. I am afraid that "Adamantine Stock" is not as good as we wish. I have made up 500 lbs. of compo. from Belden Stearic Acid and it seems much better in this respect. 1067

You may be sure that we will be more than interested in the results of Charles' analysis. I am curious to know how close two people, hundreds of miles apart, can come with no possible communication between them, and will await the result with eagerness.

I suppose you are about tired out waiting for that cabinet. Well, its coming! I have been so driven since I have been back that I have hardly had time to think. It will be ready soon though now.

Will be glad to receive the tests for doing away with "scratch." This is, of course, one weak point in the machine, and anything that will help out in this particular is valuable. 1068

Very sincerely yours,

T. H. MACDONALD.

Give my regards to all, and say to the little ones that I am only too glad to repay to them in a slight measure some of the many kindnesses I have received from you all."

1069

Macdonald to Melzer—March 29, 1895.

" MCH. 29, 95.

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MY DEAR MESSRS. MELZER : At last I have succeeded in getting your machine with parlor cabinet off to you. I shipped by freight via. the Pennsylvania. The machine is in the box in the battery compartment of the cabinet. Take out the screws in the bottom and back which hold the box in place. Then lower the front door of the compartment and slide the box out. The machine is to be set in the hole in top of the cabinet so that the plugs in corners of the plate will rest in the rubber buffers. You will note that the top of the cabinet lifts off when unlocked. The extra parts are in the blind drawer, and can be taken out through the machine hole. The machine has the balance wheel you spoke of attached. I am sorry that this should have been so long delayed, but we have been unable to get at it before.

1071

And O, that awful cylinder composition! It has nearly made me wild. "Pinholes", "Gummy" "Crystallization", etc.

1072

I cannot account for the pinholes on any theory. They come whether the material contains paraffin or not. I have put in as much as 23% of paraffin and they, if anything, grew worse. The only remedy I have found is a very high temperature, I moulded today at the startling temperature of 490° F. *They were the best cylinders I have yet made.* The heat was so great that it melted all the solder of a "swimmer" that I have made. The peculiar part of it is that small lots say of from 3 to 5 lbs. do not seem to be subject to the same troubles. I make a lot of 100 ozs. and it is all right. Poured into a cake 2½ inches thick it shows no crystallization, and the cylinders will be all right. I then make a batch of 250 lbs. and it is crystalline and the cylinders go bad. I have noticed, however, that the first moulding is invariably the best

1073

and that after the overflows and shavings are added it grows worse. I have Belden, Gross & Schneider Stearic Acid and it all acts alike.

The trouble has become so serious that we have been obliged to stop shipments. I now have over 1500 lbs. of the material on hand which will all be lost unless I can succeed in getting rid of the "pinholes" and the crystallization is not so serious. The "pinholes" is in reality a little bubble. The most serious phase of it is that often a cylinder, rough shaved, will not show any of them, but when sent out and shaved once or twice on the machine a whole nest of them will be uncovered. This also applies to the crystallization to a certain extent. 1074

I am now trying a high temperature and a long boil. It seems to improve only on those lines. I have been assured on no less authority than the former manager of the Edison Phonograph Factory that the Silver Lake People use the Acetate of Alumina, and that they do not use water. Do you think this possible? 1075
It is a serious matter to me to have a failure now, and anything that will promise success is hopeful.

I have sent for some Oleic Acid and will try that instead of the Ozokerite or Paraffin.

Give my regards to all in Evansville that I know.

Yours sincerely,

T. H. MACDONALD."

1076

Melzer to Macdonald—March 31, 1895.

A. MELZER,

Fine Toilet Soaps.

EVANSVILLE, IND. Mar. 31st, 1895.

DEAR MR. MACDONALD:—We have not heard from you for some time. We were also delayed in completing that analysis and getting off the cylinders we prom-

1077

ised to send you; the box will now go out by Express tomorrow, and will describe the contents further on.

Analysis of Cylinder fragments, shows material of which they were made is composed of

	Stearic acid.....	79.580
	Hydrocarbon (Ozokerite).....	11,790
	Rosin.....	0,000
	Sodium Oxide (Na_2O).....	4,752
	Iron " (Fe_2O_3).....	0,020
1078	Manganese " (Mn_2O_3).....	0,008
	Lead " (PbO).....	0,048
	Sulph. Acid (SO_3).....	1,641
	Aluminum Oxide (Al_2O_3).....	1,998
		99,837

The results as above, were considerable of a surprise to us, particularly the large percent of sulph. acid, and to make quite sure that no mistake was made, the determinations were repeatedly verified. It would probably surprise the Silver Lake people themselves to hear what their cylinders contain, and they would hasten to explain that they use no sulph. acid, nor Iron, Manganese, Lead; still, they are there, without question or doubt, but how they got there, is something which a good hand at guessing can answer better than half dozen chemists. The sulph. acid did not get in in the form of sulph. of aluminum or in the form of alum, as the proportions of sulph. acid and aluminum oxide as found do not correspond to either of these salts, which can be used in place of the hydrate. We can, however, obtain the same results as stated, by using partly the hydrate and partly the sulph. of aluminum or aluminate of sodium. Or the sulph. acid might have entered in the form of sulph. of soda contained in low grade and impure caustic soda. This is not improbable, and to try we sent to the grocery for a package of concentrated lye or saponifier such as is used in home soap making. We dissolved this, and found the

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DONALD.

resulting lye contained a large per cent. of alumina, sulphates, iron and what not. We will send you a package of this "saponifier" with the cylinders, dissolve it in two parts water and you will find a large red precipitate in your beaker, and if you will then take a small quantity of the clear lye in a test tube, acidulate with hydrochloric acid and add Barium chloride, you will obtain a heavy white precipitate (Ba. Sulph.) showing presence of sulph. acid. In the same way, you can prove the presence of alumina by acidulating with hydrochloric acid and adding ammonia which will convert contents of tube into a clear jelly, showing presence of large per cent of alumina.

Wholesale grocers frequently have large quantities of this "concentrated lye" that is in leaky packages which they are glad to get rid of at any price, and several years ago we tried a lot but found that the soda thus obtained does not pay for the trouble and sore fingers, and now always advise them to dump the stuff into the river. We mention all this, simply to show you one of many ways in which metals and other foreign substances may get into our productions, and without wishing to say that the iron, manganese, lead, sulph. acid and excess of alumina got into the phonograph material with the "concentrated lye" they buy at the wholesale or retail grocery. Yet it is possible.

We have explained to you in several former letters that all acids outside of the fat acid are to be excluded in making the comp. we also cannot see what good the small percents of iron, manganese, & lead could do and must consider them accidental and undesirable impurities and hence, the phonograph cyl. composition inferior to the formula we gave you and which you are now using. We understand, however, that your customers prefer the brown cylinders to those of other colors, because although not perfect, they gave better general satisfaction than the cylinders of other colors made from experimental comp. To obtain that particular reddish brown shade of the phono. cylinder, due to the iron it contains, add to your comp. a small percent

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of sulph. of iron (the copperas of commerce). In this case, we must of necessity use the sulphate, as no other form of iron would be suitable, but as the quantity of sulph. acid thereby introduced into the comp. is exceedingly small, it can do no harm. To 100 lbs. stearic acid, use about 6 ozs. or 8 oz. copperas dissolved in a pound or two of water and pour into your kettle before you add the lye.

1086 As regards the "scratch" we find that the harder the cylinder, the noisier will it be, no matter what may be the composition; hence, don't make your cylinders too hard, use enough ozo.

The box we will send you in the morning, will contain 2 cylinders each: Nos. 135, 140, 142 & 163. These are some of a score of tests made to reduce the "scratch." We tried all manner of new substances; light hydrocarbons, graphite, new metals and waxes, and have come to the conclusion as just stated. You did not answer our inquiry regarding applicableness

1087 of a tiny wheel on end of reproducer point.

In addition to above cylinders, we send you 3 cylinders each Nos. 157, 158, 159, 160, 161 & 162. The first three numbers are made in the ordinary way from 50 pts. Stearic Acid (Schneider's).

11 parts 39° Lye } Dissolved & filtered
 $\frac{1}{2}$ " Hydrate Alumina } through paper
 $7\frac{1}{2}$ " Yel. ceresin in No. 157, white ceresin in No. 158, paraffine in No. 159. For No. 160 we used a cheaper grade stearic acid & $7\frac{1}{2}$ pts. ozo. No. 161 is
 1088 made from the remelted shavings of the 4 preceding numbers, and No. 162 is made from shavings & bad cylinders of No. 161.

We consider these cylinders best up to date, and if a little more of the hydrocarbons would not make them too gummy, they would be less noisy. You will see we have made these cylinders $5\frac{1}{4}$ " long, and would also like to make them thicker, but see the machine will not take a cylinder of larger diameter.

The principal of our High School, Mr. Spear, whom you met at B. M. A. Hall, is after us to give an ex-

1089

hibition at the school; we cannot refuse and have agreed to give them an exhibition next Thursday week (Apr. 11). In the afternoon, we will preach to the pupils of the higher classes and in the evening we are to explain matters to the teachers of our city and some invited friends. We have thought out a program for the afternoon, but you will have to help us arrange one for the evening.

We believe it would be a capital "hit" for you to deliver the lecture part on one or more of the large cylinders we sent you, and thus let you do the talking to those luminaries for us. Make the lecture as long, strong and elaborate as you can. In addition to this, we would like to have about a dozen good records of classical music on the large cylinders, taken at a speed of 115-120, and if you will attend to this for us, so that we will have the cylinders here in ample time, we will be greatly obliged to you. This exhibition cannot do you any harm, and will only cost us our time (that at the B. M. A. hall cost us \$37. in addition). 1090 1091

Last week a Mr. Francis Walker gave two concerts in our city, he is a fine singer and we were anxious to get a record from him, requesting permission to place the graphophone in front of the stage on evening of the second concert. Mr. Walker preferred to interview the instrument beforehand and came to see us. He also made a record at our house "If I were a Knight of the Olden Times" which we took on our No. 125 cylinders we made when you were here and which we also send you in box. You will find the stronger notes "crashed" and Mr. Walker preferred that we postpone making record of his singing at concert hall until next autumn when he will be here again and we will presumably have the new instrument with 100 lbs. balance wheel. He also told us that some years ago he sang in Bridgeport (at "Armory Hall" we believe) and sang "Nearer my God to Thee" into Graphophone but the record was not good. 1092

Hoping that you are getting along nicely and will

1093

comply promptly with our request regarding records on cylinders sent you, we remain with best wishes,

Sincerely yours,

A & C MELZER

The cylinders we send you are not shaved, in preparing them for record, don't shave down any more than necessary, and make no records on No. 135, 140, 142 & 163. These were made solely with a view to reducing "scratch" and we don't know what effect the substances they contain may have on their keeping properties.

1095

Melzer to Macdonald--April 1, 1895.

" A. MELZER,

Fine Toilet Soaps.

EVANSVILLE, IND. Apr. 1st 1895.

1096

DEAR MR. MACDONALD :—We were just getting box ready to send off when your letter of 29th arrived. We were much pleased to learn that machine with that balance wheel is on the way, and thank you very much, but were pained to hear that you are having so much trouble with the cylinders. Believe us, that all your trouble is due to the very considerable percent of stearic acid and ozo. which is volatilized during the several hours or perhaps an entire day that you keep the composition at a high temperature in your kettle while moulding. A temperature that melts the solder of your swimmer, must necessarily volatilize your stearic acid and hydrocarbon very rapidly, but since it does not volatilize the soda also, it changes the nature of your composition, makes it too "soapy", tenacious,

1097

a condition in which it chills too quickly, not giving the heat a chance to get out, and hence the bubbles. We tried to make this clear to you in our letter describing the progressive stages when making an ash determination. The only remedy is that, when you see the composition is not sufficiently limpid, forms a skin on top and chills around the sides of your pouring pot at 150° C. you must add stock (stearic acid & ozo.) until you get it back to the proper condition. Raising the temperature excessively, only makes matters worse by volatilizing all the more. 1098

The loss of stock by volatilization is much greater than you believe; try the experiment of keeping a pound or two in your sauce pan at a temperature of 150° to 170° C. and note loss of weight after 1, 2, 3, 4, 5, & 6 hours. You will be astonished. As it is desirable to mould up the composition as quickly as possible, when finished in kettle to prevent volatilization, you will recognize the importance of having a sufficient number of moulds, or else, don't make your batches so large. 1099

This is election day in our city, and we believed it a good time to clean up our laboratory and suspend operations on the cylinders for a while, but when we read of your troubles, we concluded to make one more test, the object in view being to make a composition with less soda and more alumina, to make it "shorter", more limpid, and less liable to crystalize. We made No. 164, which is composed of following:

50 oz.	Stearic acid (Schneider's)	1100
1½ "	Hydrate Aluminum, dissolved in	
10 "	39° Lye &	
3 "	Water	

When nearly finished we added

7½ oz. ozokerite

Temperature was never over 160° C. and we mould at 150° C. This made 8 cylinders of which we send

1101

you 6, and being too warm to ream and turn off, we send them in the rough. Maybe these will suit you better than any others, if so, take your lecture record on them; they will be apt to be crisper, more friable than the others. The 3 oz. water was added to the lye simply to reduce the strength and prevent formation of those little hard lumps.

1102

It may be that the Silver Lake people have at some time used acetate of aluminum; there is surely none in the comp. we analyzed. If they use their caustic soda in the dry state, that is certainly no improvement on using a lye made with distilled water and with all impurities of the soda removed by precipitation and filtration. Suppose the case that they had used for their composition a caustic soda in the dry state, as impure or *half* as impure as the box of "saponifier" we sent you; would not that account for the substances named in our analysis? But the composition would be better without them.

1103

We enclose a clipping from this evening's "Tribune;" what do you know about this? With best wishes, and hoping to hear from you right soon with good news, we remain—

Sincerely yours,

(Signed)

A. & C. MELZER.

1104

Melzer to Macdonald—April 3, 1895.

"A. MELZER,

Fine Toilet Soaps.

EVANSVILLE, IND., Apr. 3, 1895.

DEAR MR. MACDONALD: We hope you are carrying out the suggestions in our letter of the 1st inst. and can now see your way clear to making cylinders with-

1105

out flaws, &c., &c.; at the same time we feel that the trouble you have had (and of which a little may be remaining when this reaches you) disposes you to try most anything however desperate, by way of a remedy, and fearing that you might run up your temperatures, still more, with the result that you will make an ash determination on a grand style, including your entire factory, we wish to assure you once more that your trouble is not so serious as it appears to you and the only correct remedy is to *reduce your temperature but add stock*. That we are speaking advisedly, we will prove by what occurs in our factory every day. You will have noticed when you were here, that our Laundry soap in the croutcher is a thick jelly. Its temperature is about 160° F. and when we cut that soap, we always have to throw out from 1 to 2% of the bars on % of large air holes or flaws; this percent would be much greater, were we to throw out the bars with small air holes also, which we don't do as they close up when the soap is pressed in the dies. Now we can

1106

prevent the occurrence of these flaws or air holes, by simply running a hand crutch through the frame of soap, which would release the hot air in the form of bubbles inside, and we have done this in former years, when our business was small and we were more particular to prevent all waste; we do not do this now, as the cost of working over those imperfect bars is almost nothing, and hence cheaper to throw them out than crutch the soap by hand in the frame. This example suggests, that if you could in some way draw a wire through comp. in mold before it is chilled, the confined hot air would be liberated, and there would be no flaws, but we fear, this is not practicable.

1107

1108

Here is not another example: We make transparent soap. At a temperature of 65° to 75° C. this is as thin and limpid as water, and in that condition is molded into eggs, 52 at a time. We have molded this transparent soap at that temperature into eggs day after day without a trace of flaw or bubble in one of the eggs, and then again we would not fill the mold full

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MELZER.

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enough so that the surplus soap in the pan part of the mold, which you call "overflow" would chill too soon, and as the soap in the molds cooled and contracted, there would be no liquid soap in the pan to make up for this contraction, and the consequence would be from 2 to 100% flawy eggs, that would all have to be worked over; the flaws all being near the top of the molds, which in this case is the small end of the egg.

1110

To make this still clearer to you, we enclose a diagram or sketch of our mold with one corner cut away to show vertical section. You will see it is very similar to a large letter copying press, with half of the molds in the top and the other half in bottom plate. The top plate runs in guides "A" "A," and is lifted by the screw "b" the same as in a copy press. To prevent the too rapid cooling of the soap in pan of the molds, we got two thick cast-iron plates which we kept well heated and when molds were filled, laid them on top of the pan; this kept the soap in pan warm and

1111

liquid until that in the molds had set, and we had no more trouble with flaws in our eggs; but we have since dispensed with the plates, as we find that by keeping a sufficient quantity of soap in the pan, say fully $\frac{3}{4}$ " deep, it will remain liquid long enough to prevent flaws in the eggs.

1112

Now then, why could you not cast your cylinders in molds, similar to that shown in our sketch? 50 or 100 cylinders to the mold, and if you had 2 or 3 of these, you could mold up a batch of composition before it had time to change materially by volatilization. Now permit us to say a little more about this volatilization. We have to use considerable alcohol for our transparent soap; to prevent evaporation or volatilization of this as much as possible, the little kettles in which the soap is made are supplied with air tight covers, and the temperature is never permitted to go above 80°C. nevertheless that alcohol escapes, and we are compelled to add alcohol to our soap from time to time as the molding progresses, otherwise the eggs would become opaque. Alcohol is expensive,

1113

and we contemplate getting a sufficient number of molds soon, to take at one run the entire batch of 150 lbs. transparent soap, and thus prevent evaporation of the alcohol. You see the similarity of your trouble and ours. You lose stearic acid and hydro-carbon by volatilization at a temperature of 150 to 250°C. and spoil your composition by the change thus effected, and we lose alcohol by evaporation at a temperature of 65 to 80°C. and spoil our transparent soap for the same reasons. The remedy is the same in both cases. 1114

Regarding that acetate of aluminum which you say the S.L. people use in their composition, would repeat that, there is certainly no acetic acid in the broken phonograph cylinders you sent us, but there is a good big dose of sulphuric. We cleaned up our laboratory yesterday, and came across the package of acetate aluminum you brought with you, and before putting it away examined it and found it to be the basic salt which is insoluble in water, but it will solve in lye or in sulphuric acid same as the hydrate you are using. 1115

The idea struck us; can it be that the S.L. people use sulphuric acid to solve that acetate of aluminum? If they do, the sulphuric acid being stronger than the acetic, drives out the latter by the law of might and forms sulphate of aluminum. There would be no good sense in doing this; as it would be cheaper and by far more rational to use the sulphate of aluminum at once, which is soluble in water, but they might do this for purpose of mystification. Say, they make their composition by a formula something like this: 1116

Take

100 lbs. stearic acid
 15 " ozokerite
 8 " caustic soda
 7 " acetic Al. dissolved in
 1 quart water and
 1 pint sulphuric acid

and boil at 300° F for six hours.

1117

This would be another way of accounting for the quantities of sulph. acid and aluminum oxide found as per analysis sent you, the proportions of which do not correspond to those in the aluminum salt (Sulph. of aluminum).

1118

However, it makes no difference at all in what form they use their alumina; by all means the best form is the hydrate dissolved in the lye, just as you are doing it. As repeatedly stated, you may use an aluminum salt in place of the hydrate, (Aluminum salts are the oxide of aluminum in combination with an acid) but there are objections to all of them, for the reason that the acids of these salts form corresponding salts of soda in your composition, which is objectionable. We have made in an experimental way, the composition with alum and also with sulphate of aluminum, and it appeared all right; but we know that the sulphuric acid in that alum and sulph. Al. required its equivalent of soda to form sulphate of soda in the composition, which does not belong there.

1119

We wish that we could make this so clear to you that you could not help but see it and *believe* it. There is one other form of alumina, which is not better than the hydrate, for it is the hydrate or oxide in combination with caustic soda, but more convenient. This is the aluminate of soda. We wrote to the Penna Salt Mfg. Co. about this some time ago; the reply which was delayed on account of the absence of Mr. Bour, has just arrived, and we enclose it herewith. The aluminate of

1120

soda would only be a little more convenient for you, in that you need only dissolve it in water or use it dry if you preferred, the same as caustic soda. When we have definitely decided what per cent. of alumina gives the best results, (we have made the composition with less than $\frac{1}{2}\%$ and up to $1\frac{3}{4}\%$ in No. 164 (figured on a basis of oxide Al_2O_3) and can see no particular difference, we may get the Penna. S. Mfg. Co. people to make up a few barrels of the aluminate for you in just those proportions.

In conclusion, don't get desperate, and waste no

1121

time or money trying to find out how the S. L. people do it ; your troubles are purely of a mechanical, not chemical nature, and we trust the contents of this letter and that of 1st inst. will put you on the right track.

Send us a small piece of your composition from 1st. molding, and also a small piece when your troubles with flaws &c &c. are worst, and we will tell you what your volatilization amounts to.

Wishing you well and hoping to hear from you with good news, we remain.

Very sincerely yours—

(Signed) A & C MELZER

A.

Your 1500 lbs. composition is all right. Remelt and add stock.

1123

Macdonald to Melzer—April 8, 1895.

BRIDGEPORT, Conn., April 8, '95.

MY DEAR MESSRS. MELZER : I am very glad to get the analysis. As you say it is most interesting. Charles deserves a great deal of credit for such complete and accurate work. In this connection, and with what you say about the possible cause of the SO_3 I have it from no less authority than the former purchasing agent of the S. L. people that they use Acetate of Alumina. He told me positively that he had purchased it for them by the barrel for over two years. I asked him about the addition of the soda and he states that he is positive that they add it in the dry state to the stearic acid. In this connection I would state that I made

1124

1125

some with the acetate and soda added dry according to the following :

100 oz. Schneider Stearic Acid
 7½ " Troy 98% Caustic Soda
 5 " Acetate Alumina
 10 " Ozokerite

1126

The soda was thoroughly united with stearic and then boiled for two hours until all ebullition ceased. Then the acetate was added slowly, and after all action the ozokerite added.

Our duplicating man said that these were the best cylinders he has had for some time. They did not show any traces of crystallization and were very dry.

Yours sincerely,

T. H. MACDONALD.

1127

Macdonald to Melzer—April 12, 1895.

" APRIL 12, 1895.

1128 MY DEAR MESSRS. MELZER, A number of the pieces of the cylinders you sent are developing signs of "sweating". I judge from the odor of some of them that they contain carnauber wax. The yellow show it quite considerably.

Now in regard to the reduction of scratch on the record, this is, of course, of great importance but the cylinders we now make are acceptable on that score. The users are not making complaint on account of general scratch. My difficulties are in the moulding entirely—"Pinholes" and "crystallization" are the difficulties encountered. For the last week I have been making the mixture in 14 lb. lots and immediately

1129

molding when done. Then taking all the turnings and overflows and incorporating that in next days "brews". In this way I am enabled to keep up our output which is now about 600 per day. It takes about 120 lbs. per day therefore.

I have made up a large number of cylinders by the dry process using acetate Alumina, and I must confess that the results are splendid. I sent 50 of them to Washington and Mr. Child pronounced them equal to anything yet received. I wish you would try this formula and see what you think of it. I use : 1130

14 lbs. Stearic Acid,
1 lb. 98° G. A. dry,
5 oz. Acetate Alumina.

The stearic acid is melted and brought to a temperature of 160° C. and then the dry caustic added. It unites very readily and in about an hour is entirely united. Then add the Acetate also dry. 1131

I have turned to your analysis of the S. L. cylinder many times with a deal of interest many times. Do you think it would be possible to make this mixture and get the precise result there shown?

Your cylinder No. 164 made with 1½ ozs. Al. Ox. is certainly good. I melted up the broken parts and as far as I can see it is all right. But *there is the trouble*. They are *all* good in the small batches. You will recollect how we made up some 10 or 12 small batches when I was with you, and no crystallization was manifest, but as soon as we made the large lot No. 129, we had nearly all crystals. This is my trouble, in the small lot they come out all right, nearly every time. It is the 200 and 300 lb. lots that give the trouble. 1132

The records on all the cylinders you sent are good. In fact they have always been.

I hope you have had a successful exhibition, and that the new machine has arrived safely.

I am very much crowded on my other work as we

1133

are getting out a new machine, and it takes a great deal of work to do what there is required.

Give my regards to all.

Very truly yours,

T. H. MACDONALD.

P. S.—In regard to the little ball for a reproducer point, this has been suggested a number of times, but no one has yet been able to pivot a ball only $\frac{3.1}{100}$ of an inch in diameter. I am afraid that it would not roll even if they did.

1134

Melzer to Macdonald—April 14, 1895.

1135

" A. MELZER,

Fine Toilet Soaps.

EVANSVILLE, IND. April 14th '95.

1136

DEAR MR. MACDONALD : Your favor of the 8th inst. and also box with cylinders arrived just in time. Our exhibition at High School before the teachers on Thursday evening, might have been better, but considering that it was our first attempt ; it was about as good as could have been expected. We made the mistake of too much preparation, and our failure to reproduce creditably quartette sung by 2 male and 2 female voices created a little disappointment and prejudice. We did not know they were going to ring in on us female voices until too late to prevent it. The performance before the pupils and teachers on Friday afternoon, was in every particular a success. We send you a couple of papers in this mail ; Notice in " Courier " is a fair sample of what the papers had to

1137

say about Thursday evening performance and that in "Democrat" of Friday afternoon.

We regret cylinders reached you in such bad shape, which only proves again that "haste makes waste." We got through with No. 164 cylinders about 4 P. M.; some of them were still warm when we wrapped them up, and while this writer wrote letter to you; Charley packed them in box in order to get all off on evening train. The box was not of suitable shape, but having no time to spare, we let it go believing the wrapping of cylinders would prove a sufficient protection. Express Co. must have handled the box very roughly. 1138

We regret you have trouble with composition and that we cannot convince you that the hydrate of aluminum and soda in solution is the only correct form to use these two bases, and that your troubles will certainly be increased by using the acetate and soda dry; your duplicating man's opinion to the contrary, notwithstanding. We have been working and have studied this subject thoroughly for the past six months, understandingly and with application of the laws of chemistry, which are as positive as the multiplication table. The trouble in your case, it is clear, is that you have too many things to attend to; the S. L. people make the comp. only; don't even mold it; whilst you are attempting to do both with imperfect and inadequate apparatus, superintend the mechanical part of your factory, and study out new types of machine besides. That is more than any one man can do well. The way we have taught you to make the comp. is right, and to use the acetate or any other salt, and dry soda, is wrong. 1139 1140

We have now written to you twice regarding use of a very small wheel on end of reproducer pin to prevent "scratch" and as yet are without an answer, but hope to hear from you when answering this letter, and in that connection would also like to know whether in your investigations it has been found that the sound is reproduced by reproducer pin acting upon diaphragm somewhat in the manner of a hammer striking on a

1141

gong, or in the manner of a violin bow when drawn across the string, *i. e.* whether by direct blow or by friction.

The new machine, which according to your letter, was shipped by freight over two weeks ago, has not arrived; if shipped as stated, please trace and send us B/L that we may have it looked up from this end.

1142

Thanking you very much indeed for lecture record and the musical records, and hoping that it is only a question of a short time, when after effecting proper arrangement and division of your work and installing proper apparatus, you will have no more trouble with cylinder comp. we remain with our best wishes,

Sincerely yours,

(Signed) A & C MELZER

A.

1143

Melzer to Macdonald—April 18, 1895.

" A. MELZER

Fine Toilet Soaps,

1144

EVANSVILLE, Ind. Apr. 18th, 1895.

DEAR MR. MACDONALD: Box has gone forward by Adams Exp. this P. M. and hope contents will not be broken this time.

As stated in our letter of yesterday, we have been hard at work in Laboratory since Monday morning. We laid aside our better judgment or you may call it prejudice if you like, and made a small batch comp. with dry soda and acetate of aluminum as per your suggestion. It made a comp. but the people in the street stuck up their noses and enquired whether we had gone

1145

into the vinegar business. It would make this letter entirely too long, were we to go all over the ground again and explain to you with the assistance of figures and chemical formula why such comp. is no good.

We then dissolved the remaining Greenbank caustic soda you left with us in proportion of 1 soda and 2 water, and then added to 9 lbs. of this lye, $1\frac{1}{4}$ lbs. Hydrate aluminum and dissolved by heating until just ready to boil. The water that was thereby evaporated we replenished, so that the proportions as just stated remain intact. When solution was cold we filtered through paper. We next evaporated 16 ozs. of this solution (A) to dryness, receiving $6\frac{1}{2}$ ozs. Aluminate of soda, which as you will note is composed of soda and Hydr. of aluminum in proportion of 12 soda and 5 alumina. Of this dry Aluminate of soda we also made a laboratory sample of comp. in proportion of 50 Stearic Acid and $4\frac{1}{2}$ Al. of soda. It worked, but not to suit us. 1146

We next took 11 ozs. of Solution A, placed in kettle and evaporated until consistency of mush and then added to it 55 ozs. Adamantine stock previously melted in another kettle. This also worked, but it made hard lumps, took more time and results were not as satisfactory as when soda and alumina is used in solution. The object of these experiments, you will perceive, was to keep the water out of compo. for after thoroughly discussing and considering the subject of crystalization, we must finally come to conclusion that crystalization means moisture which it is very difficult to expel from a body of 200 or 300 lbs. All the above comps. were thrown into *potpourri* box. We next dissolved in kettle : 1147

50 ozs. Stearic acid (Schneider) and added to this a solution composed of
1 oz. Sulphate of iron in
1 " Water and immediately after added
12 oz. solution A (this marks $42\frac{1}{2}^{\circ}$ by our hydrometer) 1148

1149

We boiled it at a fairly good heat, having no trouble to keep contents of kettle down, and in about an hour from time we started we added—5 ozs. ozokerite, and when no more bubbles came to surface and all foam from top gone, we molded at a temp. of 140 to 150° C. These cylinders are marked No. 168 and the iron is added merely to impart the reddish tinge you can notice in the phonograph cylinders. On shaving off these cylinders yesterday morning, we found them full of "pin-holes" filled with "white powder" as explained in letter of yesterday. We send you one of these cylinders as it came from the shaving off machine before we turned the shaving knife. It made our hair stand on ends.

No. 169 is composed of

- 50 ozs. Belden's Stearic acid
- 11 " Solution A
- 5 " Ceresin wax white; and No. 170, of

1151

- 50 ozs. Belden's Stearic Acid
- 11 " Solution A
- 5 " Ozokerite and perfumed with about 1 tablespoonful Tincture Benzoin

You will notice we used 12 ozs. Solution A for No. 168 and only 11 for No. 169 & 170. The reason of this is that the 1 oz. sulph. of Iron just about neutralizes 1 oz. of Sol. A, forming with the soda, sulph. of Soda.

1152 The essential difference between No. 168, 169 & 170 and No. 157, 158, 159 & 160, sent you about 3 weeks ago, is that the former contain a great deal more alumina and less hydrocarbon. This writer has always been prejudiced against the metals and favored using as little as possible indeed has worked for weeks trying to make a comp. without any metal. I now candidly admit that my objection to a liberal percent of alumina is unfounded. As per analysis sent you, the phonograph cylinders contain nearly 2% Al_2O_3 , which is equal to 3% of the Hydrate $\text{Al}_2\text{O}_3 \cdot 3 \text{H}_2\text{O}$. the

1153

equivalents being 102.8 & 156.8. There has always been some doubt in our mind whether we are working with the oxide or hydrate, as the two seem to be badly mixed in the minds of the dealers. We have, therefore, tested that which we received last from Heil and find it is really the Hydrate; 1.543 parts being reduced by calcination to 1.013 parts. We feel almost sure that this alumina and that which you received from Penna Salt Mfg. Co. are identical.

You will see that, whilst comps. No. 168, 169 & 170, 1154 contain about 3 times as much alumina as No. 157, 158, 159 & 160, it does not yet contain as much as the phonograph cylinders; to work up to that percent, you would have to use about 2 lbs. Hydrate Al. to 3 lbs. Caustic. It might improve the comp. but we doubt it. As you will see by examining the cylinders sent you, they are so friable that they look blistered, even when turned down with a sharp cutter, but all this disappears when they are shaved down on the graph. You may find it necessary to attach to your 1155 turning off lathe, some kind smooth shaving knife or your customers might object to looks of cylinders.

We strongly advise you to make a 50 oz. test batch, with solution sent you in bottle same as No. 169 & 170, to see just how nice and quick it works, but don't try to filter the comp., you cannot do it, filter the stearic and Hydrocarbon and handle everything nicely. The large percent of alumina makes the comp. slimy, same as starch or flour paste, which you may have seen Mrs. Macdonald force 1156 through a cloth by twisting the cloth.

It would also be too much trouble to filter all your solution through paper; if you will let it precipitate nicely in large jars, that will probably be all sufficient.

A. Klipstein's travelling man was here a short time ago and offered Greenbank's 98% Caustic at 4c. His address is 122 Pearl St., N. Y. Hill will probably do as well or better.

We could make a comp. exactly like that analysed,

1157

but what would be the use to put in a lot of stuff that the manufacturer of the phonograph Cyls would be glad to be rid of if he knew how. In No. 168, we used iron to give it the color of the S. L. cylinder, but farther than that we would not advise to imitate; it should be our aim to make a better cylinder free from those impurities. The larger percent of alumina may prove a big improvement, also in the way of reducing crystalization; we have always noticed in the past that with a large percent of metal there is less trouble from crystalization; it may also make comp. more limpid and hence less pinholes. We mail a catalogue from E. L. Hand & Co.

With our best wishes, we remain—

Very truly

(Signed) A. & C. MELZER.

A.

1159

Macdonald to Melzer—May 26, 1895.

BRIDGEPORT, May 26/95.

1160 MY DEAR MESSRS. MELZER: Your more than welcome letters have been received, and have been carefully digested. Since writing to you before this I have come to the conclusion that the so called dry mixture, that is made with acetate of alumina, is of no use. It is beginning to sweat. This is enough. We don't want to touch it again with a 40 foot pole. It has acted just as you said it would.

Very truly,

T. H. MACDONALD.

Macdonald to Melzer—June 22, 1895.

"JUNE 22, '95.

MY DEAR MESSRS. MELZER: Our cylinder material is all right in all respects except the question of that "pesky" pinhole. If I could lay that ghost I would be happy. I am using at present the following formula:

1162

51 parts Schneider Stock,
 7 parts Best Paraffin,
 11 parts $37\frac{1}{2}^{\circ}$ Lye with
 1 part Hydrate Alumina dissolved therein.

Yours truly,
 T. H. MACDONALD."

1163

Melzer to Macdonald—June 30, 1895.

"A. MELZER,

Fine Toilet Soaps,

EVANSVILLE, IND. June 30th, '95.

DEAR MR. MACDONALD:—Was glad to hear from you and to note that you are getting along somewhat better with the cylinders. The composition as you are now making it, viz:

1164

51 Schneider
 7 Paraffine
 1 Hydr. Al. in
 11 $37\frac{1}{2}^{\circ}$ Lye

is about as near right as possible, although we would be inclined to use less alumina. We find cylinders No. 157, 158, 159 & 160 of which we sent you samples, and

1165

which as you will see from our letter of Mar. 31st are composed of :

50 Stearic
7½ Paraffine, Ceresin or ozo.
½ Hydr. Al. in
11 39° Lye.

1166

keep very nicely and after all have less "scratch" than cylinders Nos. 168, 169 & 170, of which we also sent you samples and are composed of :

50 Stearic
5 Ceresin or ozo.
11 Sol. A. equal to
9.66 39° Lye
1.34 Hydr. Al.

1167

Since our last to you, we have worked up in experiments, 25 lbs. Schneiders Stearic and then ordered an additional 100 lbs. and our last comps. has now reached No. 241. Our experiments the past month have been calculated to relieve your eye sore, the "pin holes" and our ear sore, the "scratch" and to report to you in detail what all we have tried and what all we have found, would fill a book and you would have neither the time nor disposition to read it. Suffice it to say, that our opinion, repeatedly expressed, that the "pin holes" are due to faulty mechanical arrangement

1168

is correct; we are also right in our assumption that, the increase in the number of "pinholes" when working up overflows and turnings is owing to their higher degree of saponification or soapiness or tenacity owing to the volatilization during the long continued heating of part of the stearic and hydrocarbon. The relief that you find, by raising the temperature of the compo., and which is augmented by also heating the moulds, may be also classed among the mechanical, in that it thins out the compo. and keeps it in that state in the moulds long enough for the air bubbles

1169

(pin holes) to rise to the surface. We can only repeat again that, you have too many things to look after and your mechanical arrangement or apparatus is too primitive and inadequate to obtain the best results. By making your cylinders a dark color, you may hide their imperfections to the eye, but you cannot deceive the ear. We now feel so confident, that if properly fitted up, we can make cylinders immeasurably superior to anything that can be made in a sauce pan in the laboratory, and superior to anything you have ever 1170 seen or heard of, that, we will undertake to make them for you if we can make an arrangement with your Co. that will justify us to go into it right, or if this don't suit you, this writer will come over to Bridgeport and spend a week or two with you chasing that pinhole ghost.

Your intention to get a practical chemist to take charge of your cylinder dept. is a good idea, if you succeed in getting the right man; but "there's the rub!" to quote Bangs in Hamlet's Soliquy. Charley 1171 has been hunting ten years for a good soapmaker; he has tried half a dozen, resulting only in loss, expense and annoyance, and to-day is still attending to his kettles himself. If you get a chemist, try by all means to get an American. The foreigners that come here from Heidelberg, Greifswalde, Bonn, &c., &c., are frequently frauds, who have studied Bierology more than chemistry and are as impractical and unmechanical as is possible; a dozen of these fellows could not help you out of your trouble with the pinholes in a 1172 lifetime. In last number of soap Journal, we saw an article on "Medicated Soap" by "H. C. F." We believed this was by a gentleman of our acquaintance, whose full initials we don't remember and wrote to Gathmann for information. This his answer: "As to H. C. F., he is evidently not the party you speak of. He is a German chemist a Dr. Fehrliu, who was for a time with Kirk's; went recently to Fairbank's in St. Louis and has already left there again. He wrote the article in recognition of our assistance in getting him a

1173

job with Fairbank's." We believe this is the man you had some correspondence with.

Will take a few song records on some of our last cylinders and send them to you in a day or two.

With best wishes & respects, we remain—

Sincerely yours—

(Signed) A & C MELZER

1174 Great caution should be exercised, before acquainting any one with the formula and mode of making your cylinder compo. you know what value the Silver Lake people place upon it and know also how much time, labor and expense it cost you & us. If you should be unfortunate enough to get the wrong kind of man who leaves you or whom you have to discharge after a short time, he will carry away your factory secrets and after a little while you may find every one requiring 100 cylinder a year, making them himself.

1175

Macdonald to Melzer—July 2, 1895.

" BRIDGEPORT, CONN., July 2, 1895.

1176 MY DEAR MR. MELZER—Your esteemed favor of recent date received. I am sure that we will be more than glad to have you visit us for as long a time as you can make it convenient to spare. We will be pleased to bear your expenses and whatever proper remuneration for your time that may be decided on.

Your remarks about a chemist have been read with a good deal of interest, as the very point you mention has been one that I have thought over a great deal, that is the placing of the formula in the hands of a man that we may have to discharge in a week. I have had answers from some six persons in answer to my

1177

advertisement in the N. Y. Herald. Five from New York and one from Boston. Only two of the number were Americans. The balance were Germans I should judge.

I have no doubt that many of our troubles arise from the difficulties you mention, that is imperfect means of moulding the cylinders, as well as making the material. Still the way in which these "pesky" pin-holes act seem to negative that proposition. We find them appearing right in the middle of a moulding for a time, then disappearing, and again reappearing. Perhaps a hundred cylinders will be affected in a batch of 500, and these will frequently come all at once.

1178

However, if you come on we can go over the matter at our leisure, and see all the troubles that arise in the work.

Hoping to hear from you soon, I remain,
Yours truly,

T. H. MACDONALD."

1179

Macdonald to Melzer—August 11, 1895.

" 13 Cottage St.,
BRIDGEPORT, CONN.,
Sunday, August 11, 1895.

1180

MY DEAR MR. MEZLER :

Cylinders seem to be going along all right. Pin-holes are very scarce, so much so as to be of no consequence whatever.

* * * * *

Sincerely yours,

T. H. MACDONALD."

1181

Macdonald to Melzer—Dec. 21, 1895.

"DEC. 21, 95.

MY DEAR MR. MELZER, Your letter inclosing bill of The Columbia Phonograph Co. received.

1182

This bill should not have been sent, in fact no bill at all should have been sent you for the stuff. I arranged the matter with Mr. Easton and it was then understood. The only explanation I can offer is an oversight in the Washington Office. However I have written them again, and the matter will be arranged as it should have been in the first place, that is no charge will be made.

1183

I certainly feel about the matter as you do, that your services have been of immense value to this Company, much more than you have received remuneration for, and were the matter in my hands to do, I would be only *too* glad to render such small favors as the before mentioned transaction.

I sincerely regret that anything has occurred that has annoyed you and hope that our pleasant relations may not be affected thereby. Myself and family remember you so pleasantly that we cannot but feel solicitous that we still retain all our old friendly feelings.

Hoping to hear from you soon, I remain,

Very truly yours,

T. H. MACDONALD."

1184

Macdonald to Melzer—Sept. 3, 1896.

"BRIDGEPORT, Sept. 3, 96.

MY DEAR MR. MELZER: It does not seem natural that I do not receive a letter from you once in a while. What has become of you? How is the toilet soap business? If the business is as good as the soap it

1185

ought to be booming even in these piping 16 to 1 times. By the way what is the matter with free coinage of soap? It seems as though one industry ought to have as good a show as another. We have felt the political blight pretty badly this summer. It has cut down our business pretty severely.

I have a steam jacketed plant for cylinder making in full operation now. It is doing very well indeed. I have used the three floors in the wing where we made the wax when you were here. On the top floor I have two kettles side by side, directly under these on the second floor are also two kettles the same size, while under one of these in the basement is the fifth kettle. The rooms in the second floor and basement are made as 'dust proof' as possible. They are covered with tin throughout. When we start a batch we place 400 lbs. stearic acid in one of the top floor pots. When this is thoroughly melted it is allowed to run down through a pipe, controlled by a valve in the bottom of the pot, through a filter into the pot in the middle room. At the same time in the second pot on the top floor we melt down a quantity of shavings which is also filtered down into the pot beneath. In the middle room the mixture is made, and then the filtered chips are baled over into this pot and the entire amount passed down through another pipe and filter into the room in the basement where the molding is done.

I send you by Adams today a box containing 20 records made on our last cylinders, also four blank cylinders. You can judge from these how we are getting along with the wax.

I recently learned an interesting thing in connection with the Phono. cylinder. A party who pretends to know states that it is made of Stearic Acid, Caustic Soda, Sal Soda, "Aluminum Bronze Powder" and water. The alleged process is to dissolve the "Al Bronze" in a solution of Caustic & Sal. Soda, and then unite this with the Stearic Acid, as we do. They use white Ozokerite for softening the mixture. I have found

1189

that "Aluminum Bronze Powder" is pure Aluminum ground to an almost impalpable powder. I wrote to N. Y. and obtained a sample of it. I inclose a little of it in an envelope. I did not learn anything in regard to the proportions to be used. What do you think of it?

Mr. Patterson is very quiet now. Hardly anything doing in his line. Mr. Lyon mentioned you recently and wished to be remembered. Little Russell speaks
1190 of you frequently. I have his picture taken this week, and he is going to send you one as soon as they are finished. Mrs. Macdonald wishes to be remembered to you kindly.

Let us hear from you.

Sincerely yours,

T. H. MACDONALD."

1191

Melzer to Macdonald—Sept. 9, 1896.

"A. MELZER,

Fine Toilet Soaps,

EVANSVILLE, IND. Sept. 9, 1896.

1192

DEAR MR. MACDONALD:—Your favor of the 4th inst. is to hand also the records which arrived yesterday. From manner you answered my last letters, I believed my long epistles were boring you, but I am not very mad, and indeed glad that you are getting along so well in the cylinder business. As to the records you sent me, they are splendid; these cylinders look very like those I made when at your place last summer, showing also the cooling or crystallization line in center which I have never observed on any of the cylinders I have made here; but this seems to be no

1193

detriment, and the records I sent home last summer are as good today as when they arrived, hard and glossy, but a little more "scratchy" than the last you sent. The former lot you sent me (about 3 months ago) show a disposition to whistle, which was not the case when first they came to hand, but are all right otherwise. Accept my best thanks for this agreeable surprise. I have only discontinued quite recently, my experiments with cylinder composition, and believe I can claim conscientiously that I have not left a single

1194

stone unturned in my endeavor to produce a cylinder without "scratch". I have studied crystallography and then applied this knowledge to prevention of crystallization; have made fat acids from all manner of fats (ricinic, cocinic, palmitic, &c, &c) have employed all manner of new substances that you have never dreamt of, and have experimented largely with rapid chilling of the molds by plunging into water of various degrees of coldness, directly after the molds are filled, but all to no purpose; there seems to be just so much "scratch", which cannot be prevented by changing the composition or manner of molding the cylinders. I now believe the trouble is a mechanical one; the point of the recording stylus, lies upon the cylinder at a pretty sharp angle thus: (SKETCH) as it is pressed *down* by the diaphragm, it makes a smooth cut, but as it rises from the cylinder it chips out small particles of the brittle cylinder substance and leaves a rough track aside from the record proper. To illustrate, take a chisel and force it into a

1195

piece of wood at an angle of 45°, and then pry upon it, the downward cut will be smooth, but the upward cut, will be rough. The right principle for making the record, would be to indent it with the "reproducer" in place of cutting it with the "recorder". To do this, a warming chamber would have to be attached to the machine, wherein the cylinder would be heated to and kept at a temperature that would make it plastic and easy for the reproducing point to indent; after cooling, the cylinder would be hard, and bear a deeply in-

1196

1197

dented and consequently loud record. I have made some experiments in this direction but find my cylinders crystalize whilst being brought to and kept in the plastic state, so that the next problem is to make a cylinder which outside of becoming soft and hard according to the temperature will not change otherwise.

1198

As to the recipe of your informant, would say there is nothing in it, but I will give you the reason why, and I trust you will carefully note and believe what I tell you. Aluminium is unquestionably the most suitable metal for cylinder composition. The most suitable form and at the same time the purest and cheapest is the hydroxide, which costs you 5c per lb. 66 parts of which will go as far as 27.4 parts of the metal, costing at least 10 times as much. Thus you see it would not be good sense to use the metal, and the height of folly to use the metal in the form of the bronze powder, which is less pure than the solid aluminium and costs 3.00 or 4.00 per lb. For the sake of the good opinion I have of Mr. Edison, I hope your informant is yarning.

1199

Sal Soda, *i. e.*, carbonate of soda is all right, and I have used it off and on in my cylinders, but the only advantage it has over the caustic, is that it is a little cheaper, which in the quantities you use, would cut a very small figure, and would be more than offset by the extra work it would cause you, in that when coming in contact with the stearic acid, carbonic acid gas is liberated, causing a great commotion and possible running over of your kettle. White ozokerite or ceresin, is no better than paraffine wax; the only advantage I can see is that, ceresin is made that has a considerably higher melting point, *i. e.* is harder than paraffine wax, but then paraffine wax of 133-136°F. m. p. is hard enough for all your purposes and hence there is no object in paying more for ceresin and running the risk of getting an adulterated article with a melting point below that of good paraffine. While on this subject I wish to caution you against using a soft paraffine

1200

1201

or a soft *i. e.* oily stearic acid, or against using any oil, mineral or animal for softening your cylinders, it will be sure to "sweat" out in warm weather; I have had several such cases happen to myself and can trace them all to the use of oleic acid, soft paraffine wax, cylinder oil, adamantine stock, &c. &c. Last Spring I bought a lot of records direct from Russell Hunting, among these were some of very light color, and all of them began sweating this summer and had to be wiped off before every reproduction. I wrote to Hunting asking him when he bought those cylinders and he answered that he could not tell where he got them. They cannot be from you, as they are of lighter color than you could make in iron vessels. I wrote to Audem for 2 blanks that he could guarantee as coming from Edison's Co. I wanted to watch them to see what they would do; but the weather from now on will probably be too cool to produce sweating; I note these cylinders are almost white. I send you one of these Edison cylinders by Express today, prepaid, also one of my No. 353. Now to come back to carbonate or sal soda. When in Bridgeport last summer, I gave you the formula for my No. 244, which is made of stearic acid, carb. soda caustic soda, hydrate of Al. & Paraffine wax, and now I will give you the formula of No. 353 mentioned above, which comes even nearer to your informants recipe, having in this case actually used metallic aluminum; (just for fun) but it did not cost me anything, as I made one of our breweries furnish the aluminum in the form of medals like sample enclosed.

1202

1203

1204

No. 353 is composed of

100 oz. Stearic acid

8 " 37° Caustic lye

$\frac{1}{4}$ " Metallic aluminum

23 " Carb. Soda solution 31°

21 " Paraffine wax

You will find No. 353 (has record) no better than the average, still if you wish to know I will write you explicitly how to make it.

1205

As to my business, I regret to say, it is worse than bad, but I am not worried, as I have enough to live and can associate myself with Charley any time Charley is making very extensive changes and improvements. It will be another month before he gets through, and will then send you a picture of his factory, also of "Casey" who is a fine dorg, I tell you. I could write you a whole lot more "stuff" but remembering my promise in last letter to confine myself to one page, I beg your forgiveness for this one case under promise that I will not do it again soon.

1206

With best wishes and kindest regards to Mrs. M. Russell, Louise, Mr. Patterson and the Lions, I remain—

Sincerely yours—

(Signed)

A. MELZER.

1207

Macdonald to Melzer—Sept. 21, 1896.

"BRIDGEPORT, Sept. 21, '96.

MY DEAR MR. MELZER:

1208

Now in regard to the formula I mentioned as coming from the E. people. I am afraid you will have to modify your good opinion of Thomas as there is little doubt that their formula is practically what I told you. In fact the man who gave me the information came to the factory, and with the materials which I bought for him made up some 400 cylinders and they are *all right*. They do not seem any better than ours, neither do the Edison.

I am to have a number of records made on them and I will send you a dozen to-morrow.

1209

He has not given me the exact formula but as I saw him make it I think it was very nearly as follows :

100 lbs. Stearic Acid,
 { 23 lbs. Sal Soda }
 { 1 lb. Caustic Soda } dissolved in

about 5 gal. water and then add at boiling point $6\frac{1}{2}$ oz. Al. Bronze powder.

I will send in box to-morrow $\frac{1}{2}$ lb. of the Al. Br. Powder and you can if you desire try an experiment with it. 1210

Our business is not as good as we would wish, but we hope for an improvement this fall.

By the way what are your opinions as Free Silver's chances in your vicinity? Do you think it will carry Indiana? It hasn't the ghost of a show here.

Sincerely yours,

T. H. MACDONALD."

1211

Melzer to Macdonald—Sept. 30th, 1896.

" A. MELZER,

Fine Toilet Soaps,

EVANSVILLE, IND., Sept. 30th '96.

1212

DEAR MR. MACDONALD: Your favor of the 21st came to hand last week. I deferred answer, wishing to see the Al. Bronze cylinders you were going to send next day, but they have not yet made their appearance. Don't send me any Al. bronze, it would be a reflection on my better judgment to waste such material, and if Edison really uses this in his cylinders, then I can only hide my face and weep over the fall of another of our idols.

1213

If you prefer to make cylinders of quality corresponding to those you have been making in the past, by using Al. bronze, sal soda and oceans of water, that is your privilege. In the soap business, profits are small, and in choosing between materials and processes, that furnish the same results, we always take the cheaper and most expedient. Of course in your business, the profits are several hundred per cent., and you can afford to be extravagant.

1214

The process of making No. 353 is as follows :

Dissolve $\frac{1}{4}$ oz. scrap aluminum in 8 oz. 37° caustic Lye cold. Filter the solution through paper to remove the iron in form of black flakes, then mix with 23 oz. 31° carb. soda solution made from Carbonate soda of commerce ("58% Alkali") or from sal soda and boil this with 100 oz. stea. acid in the usual way. I used 21 oz. Paraffine wax, wishing to make a soft cylinder, but do not approve of using so large % paraffine ; 10% is enough.

1215

Since my last to you, I have discovered that, the cause of cylinders turning eccentric fashion on the mandrel, is largely due to a disposition to draw out of shape when containing a liberal percent of paraffine wax, the same as paraffine candles and some stearic acid (Star) candles will do. Cylinders containing no paraffine wax, and those in which I used cocinic acid in place of the wax, will not do this. I have in my collection but one cocinic acid cylinder, and that has a record I cannot spare, so have made up a small batch

1216

of these cocinic acid cylinders and send you a couple by Exp. today. I send them as taken from the molds and wish you would note carefully what a nice tough shaving they make in turning off and shaving on the phone. I also send you my 2 records of "Image of the Rose"; number 1 I rec'd in a dozen I ordered from Columbia Phono. Co. over a year ago. These all sweat and are ruined. Number 2 was among the 40 records you sent me several months ago; these "whistle" which you may be able to explain, I cannot. Please send me a couple in place of these: "Das Bild

1217

der Rose " is one of my favorite songs, and think it is almost as pretty as Mrs. M.ne Bild. I don't bother my brains about politics ; the idea about free silver coinage is to my mind, almost as crazy as the idea of using Al. Bronze in phono. cylinders, and if the Democratic Candidate should be elected, I don't believe they would attempt to carry out that free silver nonsense ; but should they try it the case would very probably be thrown into the courts and means found to enjoin them.

1218

With best wishes and respects to everyone, I remain—

Sincerely yours—

(Signed) A. MELZER.

Macdonald to Melzer—Oct. 6, 1896.

1219

" BRIDGEPORT, CONN., Oct. 6, 96.

MY DEAR MR. MELZER: I sent you by Adams Express yesterday six records on the cylinder which we have had under discussion. They are certainly good, and they are made in exactly the way I have stated to you. They have so made them at Edison's place, and if your idol stood on a more scientific foundation than this, to earth he must come at last!

The young man who made these, and they are out of a batch of 300 lbs. made them in my presence. I did not ask him for the exact weight of his ingredients, but they were about as I have written you. The mixture takes about the time ours takes.

1220

I made up a batch of cylinders today with scrap aluminum, as you directed in your last. Will try them tomorrow.

sincerely,

T. H. MACDONALD.

1221

Melzer to Macdonald—Oct. 16, 1896.

" A. MELZER

Fine Toilet Soaps,

EVANSVILLE, IND., Oct. 16th, 1896.

1222 DEAR MR. MACDONALD: Your favor of the 6th also
the 6 cylinders was duly rec. These cylinders are
certainly all right, but I can discover nothing in the
composition you mentioned in letter, that would war-
rant expectation of better results than those you have
obtained in the past. I fully maintain what I have
said about carbonate soda and Al Bronze powder in
my former letters. It is a round about and expensive
way to obtain the same ends; indeed, when you dis-
solve metallic aluminium in an alkaline solution, water
is decomposed, the hydrogen of same being liberated
1223 and the oxygen is taken up by the metal to form alu-
minum hydroxide for which you pay 5c. per lb. when
you buy it as such, and why in addition, Al. powder
should be used in place of the cheaper Al scrap is be-
yond my ken.

1224 In figuring up the Edison compositions, I find he
used 7.43% Sodium Hydroxide (Caustic soda) which
is right, I use 7.50 to 7.75% and today made an ex-
perimental batch, using 7.97½%. This is too much,
and it is very difficult to mold cylinders containing so
large per cent of soda. The 6½ oz. Al. Bronze powder
are equivalent to 18.6 oz. of the Hydroxide, which is
likewise about right, although I generally use less.

In making a solution of Hydrate Al. a few days
ago, I noticed quite a precipitate deposited in the
beaker, this was due to my lye being somewhat
carbonated from age. I would recommend that you
dissolve your Hydrate day before using and decant
carefully so you get no precipitate in your kettles. It
is just possible, that your hydrate Al., being a cheap
com'l article, contains some Silica and which solves

1225

partly in caustic lye and partly in precipitated. I have ordered some pure from Pittsburgh Reduction Co. which should be here to-day or to-morrow and will send you part of it.

Cocinic acid is made from Coconut oil ; coco stearic acid is next thing to an impossibility, as coconut oil contains so little stearine, it would take a ship load to make a ton of stearic acid. I use it only to soften the cylinders and leave off the Paraffine wax. The two cyl. I sent you are composed of :

1226

35 oz. Merks Stearic acid
 $3\frac{1}{2}$ oz. Cocinic acid
 $\left\{ \begin{array}{l} 9\frac{3}{4} \text{ oz. } 36^\circ \text{ Caustic Lye } (=7.6\% \text{ NaHO}) \\ \frac{1}{4} \text{ " Hydrate Al.} \end{array} \right.$

I made the cocinic acid in our laboratory and used up all I had for my experiments. I fear you will have difficulty in finding it. Try the Oil Seeds Pressing Co. Brooklyn, and N. Y. Also ask Gross the stearic acid man, if he will not make some for you. If you cannot find it, let me know and I will give you the address of a Hamburg house that I feel certain can supply you. 1227

Hoping everything is working nicely with you, I remain with best respect to all—

Sincerely yours

(Signed) A. MELZER.

1223

Macdonald to Melzer—Oct. 17, 1896.

" BRIDGEPORT, Oct. 17, 96.

MY DEAR MR. MELZER :

* * * * *

The young man of whom I spoke in my former letter assures me that every cylinder made at the Edison

1229

Works during the last four years have been made with Al. Bronze Powder. He has made us a quantity of them exactly, so he says, as they are made there, and to tell the truth they are good cylinders and resemble the phonograph product so closely that I cannot tell the difference. So *down* comes that *idol*!!

* * * * *

Very truly yours,

T. H. MACDONALD.

1230

Melzer to Macdonald—April 11, 1897.

"A. MELZER,

Fine Toilet Soaps,

EVANSVILLE, IND. Apr. 11th, 1897.

1231

DEAR MR. MACDONALD: Your favor of the 1st inst. is duly to hand, also the bottle of Cocinic acid which is all O. K. To make sure of this, I made a small lot of cylinders with same, which I regret, are much discolored because I was often interrupted at my work through which the material became overheated. The number of these cylinders made with your cocinic acid, is 421.

No. 409 which you mentioned in your letter as being best, is composed of

1232

91 oz. Stearic acid,

9 " Cocinic "

1 " Hydrate Aluminum

25 " 36° Caustic Lye.

The other numbers I sent you differ mainly in that they contain larger percent of cocinic acid, or paraffine and other waxes in place of cocinic acid, or are made with different brands of Hydrate Aluminum or Metallic Aluminum. The results, however are practically the

1233

same, with slight difference in favor of cocinic acid not exceeding 10% in quantity.

The cylinders I made with your cocinic acid are made in same proportions as No. 409, with the difference that for $\frac{2}{3}$ of the caustic lye, I substitute the equivalent in carbonate soda solution. I have not tested quality of these cylinders by making a record.

I have all along had an idea that I am not obtaining the best results in the way of recording, because of slow and imperfect shaving by hand 1234 and possibly faulty knife and recording stylus, (the one I use is not hollow ground). At any rate,

I cannot get a perfect surface on my cylinders however much I try and change the adjustment of shaving knife. I now feel confirmed in this my belief after reading Mr. Emerson's chapter on shaving cylinders and making records in Tewksbury's Manual, which is a very handy little book. I note in chapter on cylinders, the writer holds that the ingredients may be known to others, but that Mr. Edison alone possesses the secret of their 1235 proper combination &c, &c. I should like to convince that gentleman, the Col. Phono. Co. and all the doubting Thomases, that others can make as good cylinders as Mr. Edison, and for that purpose have expressed to you 3 cylinders each Nos. 406, 407, 409, 411, 412, 421, which I request that you take to Mr. Emerson when you next go to N. Y. have him shave them carefully, place in favorable position along with Edison blanks and make records thereon (no "toughs" or nigger songs, I want only the very best vocal and choice in- 1236 strumental music on these cylinders) I would like to have these cylinders reduced in size which is not necessary, as the phonographs will easily take this size cylinder, but if absolutely necessary to reduce the diameter, this would be a lesser objection, although I would prefer present thickness. Together with the records made on my cylinders, I would like to have a few of the same records on Edison blanks, made at the same time and under precisely same conditions, by way of comparison. Such a test of cylinders would be con-

1237

clusive and I hope would settle this matter for good to the satisfaction of Mr. E. and all concerned.

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Up to No. 412 are cylinders I made before I met with accident of January 4th. In the past two weeks I have made comps. Nos. 413 to 420, although my condition physically is such I ought not to use my arms. These numbers embody experiments on lines entirely different from any undertaken before, and over which I pondered while flat on my back; I regret to say not a single favorable result did I obtain from one of these, and I am now fully convinced that I can do no better; greater care in preparing and working up the materials that are now used for the cylinders, and greater nicety and care in the mechanical manipulations in making records are the only hope excepting one, and that is, to make records by indenting in place of gouging and breaking out. The man that will succeed in making such a record on a cylinder of similar material to present, will produce

1239

a record differing only little from the natural voice or tone of resp. instrument and would elevate the phonograph & graphophone to a plane that would secure for it ready admission to the homes of the hypercritical and ultra refined, when as yet phonographs music is tabooed as fit only for the savage.

In hopes that you are all enjoying the best of health, I remain with best wishes & respects to your family & friends.

1240

Sincerely yours,
(Signed)

A. MELZER.

1241

Macdonald to Melzer—April 17, 1897.

BRIDGEPORT, April 17, 1897.

MY DEAR MR. MELZER :—

* * * * *

I am very certain that Mr. Emerson was mistaken in his statement that Mr. Edison was the only one who knew how to make the cylinder compound. That book, to which you refer, was little more than an advertising pamphlet anyway. 1242

* * * * *

Very sincerely yours,
T. H. MACDONALD."

1243

Macdonald to Melzer—June 20, 1897.

"BRIDGEPORT, June 20, 97.

MY DEAR MR. MELZER :

* * * * *

We have been making a large number of cylinders on the Edison method, that is using the metal Aluminum and Sal. Soda in the solution. We are now making up some special cylinders for Mr. Emerson's use, but not that way. They are being made on your formula. 1244

* * * * *

Sincerely yours,
T. H. MACDONALD."

1245

Defendant's Exhibit Macdonald Telegram.

1246 "THE WESTERN UNION TELEGRAPH COMPANY

INCORPORATED

Number	Sent By	Rec'd By	Check	752
48	W. Br.		Paid	

1247 Received at the Western Union Building, 195
Broadway, N. Y. Nov. 2, 1894.
Dated Bridgeport, Ct.
To J. C. ENGLISH,
Care Columbian Time Recorder Co., 22 Jacobs
St., N. Y.
Have missed train—will reach there about four."
T. H. MACDONALD."

1248

Defendant's Exhibit Emerson Affidavit,

UNITED STATES CIRCUIT COURT

DISTRICT OF NEW JERSEY.

AMERICAN GRAPHOPHONE COMPANY,

vs.

UNITED STATES PHONOGRAPH COM-
PANY ET AL.

In Equity
No.

1250

Affidavit of Victor H. Emerson.

STATE OF NEW YORK, }
County of New York, } ss. :

1251

VICTOR H. EMERSON, being duly sworn, deposes and says as follows :—

I am 29 years of age, and reside in Newark, N. J. I have been the general manager of the United States Phonograph Company from the time of its organization, in the spring of 1893, until the present time, and have been its president since January last.

I am, and have been for the past two years, the general manager of the New Jersey Phonograph Com-
pany, and have been in its employ since 1889. 1252

I have read the affidavit of George E. Tewksbury, given in this case. The facts stated by Mr. Tewksbury are true, and especially it is true that all the phonographs and phonograph supplies purchased, used and sold by the United States Phonograph Company have been purchased from the local or sub-companies having licenses under the patents in suit, and particularly from the Kansas and New Jersey Companies.

1253

With regard to the statements made in the affidavit of Mr. Easton, given for the complainant, relating to negotiations for a license from the American Graphophone Company, I wish to say that at the time of the occurrences to which Mr. Easton refers, the price charged for the blank record cylinders was so high that the officers of the United States Phonograph Company contemplated attempting the manufacture of such cylinders itself, provided that could be lawfully done.

1254 With that end in view, we opened negotiations with the American Graphophone Company, as stated in Mr. Easton's affidavit, but before an agreement was consummated, we were advised by our counsel that the patents owned by the Graphophone Company would not be a sufficient protection to us in that manufacture, and consequently we refused to make the agreement, and continued to do business as we had before done it, and as we have since done it, by purchasing such cylinders from the licensed companies of the North

1255 American Phonograph Company.

The commercial failure of the graphophone down to the time of its adopting the features of the phonograph, and particularly the failure of the Graphophone Company to produce a cylinder for receiving musical and other exhibition records which would be practically useful, as stated by Mr. Tewksbury in his affidavit, are facts well known to me. As further confirmation of this situation, I will say that it has come to my attention that the Graphophone Company has

1256 made efforts to secure information as to the composition and method of manufacture of the Edison Phonograph cylinders. In July 1894, I was approached by Mr. R. F. Cromelin, an officer of the Columbia Phonograph Company, and an active associate with Mr. Easton in the exploitation of the graphophone, who, assuming that I knew the composition and method of manufacture of the Edison Phonograph blanks, asked me to disclose the same, and suggested that if I should go to Washington and give Mr. Easton the information, I would

Defendant's Exhibits.

349

1257

be paid liberally. This episode resulted in a correspondence between Mr. Easton and myself early in August, 1894, in which Mr. Easton urged me to give him the information, and I refused to have anything to say upon the subject.

VICTOR H. EMERSON.

Sworn to and subscribed before me this 28th day of November, 1894.

EUGENE CORAN,
Notary Public,
Kings & N. Y. Counties.

1258

Defendant's Exhibit, Higgin's Note No. 1.

FORMULAR—MARCH 19TH

600 lbs. St. acid
23 gal. water
135 lbs. Sal soda
2750 grams Caustic soda
1035 " #1
120 lbs. cercin
Congealing point before putting Cercin in 288, with cercin 282

1259

Defendant's Exhibit, Higgin's Note No. 2.

FORMULAR—MARCH 28TH

600 lbs. St. acid
135 " Sal soda
2750 grams Caustic soda
1090 " #1
120 lbs. Cercin
Congealing point before putting in Cercin 270, with cercin in 278.

1260

[29717a]

UNITED STATES PATENT OFFICE.

916
350

HENRY PEMBERTON, OF ALLEGHENY, PENNSYLVANIA.

IMPROVED SAPONIFIER.

Specification forming part of Letters Patent No. 53,865, dated April 10, 1866.

To all whom it may concern:

Be it known that I, HENRY PEMBERTON, of the city Allegheny, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in the Manufacture of Saponifier or Concentrated Lye; and I do hereby declare the following to be a full, clear, and exact description thereof.

The article known as "saponifier" or "concentrated lye," as heretofore manufactured and put up in small air-tight packages or boxes, under Letters Patent of the United States granted to George Thompson, of Philadelphia, is composed of the hydrated alkalies of soda or potassa that most commonly employed for this purpose being hydrate of soda. This caustic alkali is obtained from carbonate of soda by dissolving the carbonate of soda in boiling water, to which is added slaked lime. The lime, decomposing the soda, abstracts the carbonic acid from it and becomes carbonate of lime, which, being insoluble in water, is precipitated, and the clear liquor, being decanted, is evaporated to dryness, the result being hydrate of soda. The carbonate of soda used for this and other purposes, and, indeed, almost the entire supply of soda used for preparing the various compounds of sodium, has been heretofore almost exclusively procured from the chloride of sodium, or common salt.

My improvement consists in the use of the aluminates of the alkalies, or of the mixture of the aluminates with the hydrates of soda or potassa instead of the hydrates alone, in the preparation of saponifier for the manufacture of soap.

The advantages of the entire or partial use of the aluminates of these alkalies for the purpose named are very important and will be hereinafter set forth.

In order to enable others skilled in the art to use my said improvement, I will proceed to explain the process of manufacture and the ingredients employed therein.

For the purposes of this invention I prefer to use the mixture of aluminate and hydrate of soda obtained by the decomposition of the mineral known as "cryolite" or kryolite—a translucent whitish mineral found in Greenland. This substance is a sodafluate of alumina, being a natural combination of fluorine, sodium, and aluminium.

The mineral cryolite is first reduced by grinding to a fine powder, and is then boiled in a suitable vessel containing a sufficient quantity of water with which slaked lime is mixed. The relative quantities of cryolite and slaked lime to be thus boiled together are one hundred parts of powdered cryolite and seventy-eight parts of lime, the lime being measured as quicklime, or before it is slaked. This mixture is kept boiling for a sufficient time to effect the required chemical changes—say about two hours—and results in the formation of fluoride of calcium and a mixed solution of hydrate of soda and aluminate of soda. The result of the boiling is drawn off into suitable vessels and allowed to settle, when the fluoride of calcium is precipitated, leaving the clear liquor or solution of hydrate and aluminate of soda, which is decanted. The precipitate may then be washed, and the water of washing added to the liquor which had been drawn off previously.

The liquor obtained as just stated is then evaporated to dryness, the resulting salt produced being a solid compound or mixture of aluminate of soda and hydrate of soda. This is pulverized and packed in small quantities of any convenient weight—say one pound or more—in suitable air-tight packages or boxes made of any suitable material, such as iron, tin, paper, pasteboard, or wood. If the box, case, or package is non-metallic it may be rendered air-tight by the use of glue, varnish, or other article which will close the pores and joints.

Although the use of cryolite, yielding, as it does, a mixture of aluminate and hydrate of soda, is a very convenient means of manufacturing saponifier from aluminate of soda, I do not wish to confine myself to the employment of that mineral, nor to the mixture of the hydrates of soda or potassa with the aluminates of those alkalies, as any compound may be employed consisting in whole or in part of the aluminates of soda or potassa, with or without the admixture of the hydrates of those alkalies, and any material which yields alumina by chemical treatment may be used in the process.

The use of the aluminates of soda or potassa in the manufacture of caustic alkalies, either with or without the admixture of the hydrates of those alkalies, is a great improvement on the employment of the hydrates alone.

The advantages resulting from my improvement are, first, the superior cleanliness, whiteness, and purity of the soap manufactured with caustic alkali made in whole or in part with aluminate of soda or potassa; second, the increased detergent qualities imparted to the soap by the presence of the alumina; third, the removal of the caustic and irritant qualities usually possessed by all soaps in a greater or less degree, which effect is produced by the combining of the alumina with the excess of alkali which is present in the soap or becomes free in the act of using the soap for washing, thereby forming a neutral aluminate of the alkali, which, while it acts as a powerful detergent, exerts no injurious influence on the skin nor upon the most delicate fabric; fourth, the greater cheapness of the process of preparing the aluminate of soda or other alkali in comparison with the cost of preparing the hydrated alkalies; fifth, the much greater facility with which the aluminate of the alkalies can be protected from the action of the atmosphere, which would destroy its usefulness, than the hydrated alkalies, owing to the readiness with which the latter deliquesce and their greater caustic properties. The alumina present in the aluminates of the alkalies renders them less liable than the hydrates to absorb carbonic acid, which absorption, taking place on their slightest exposure to the atmos-

phere, causes them to deliquesce and renders them inoperative, owing to the formation of the useless and inactive carbonate of soda or potassa.

The hydrated alkalies are so highly corrosive and caustic in their properties that they cannot be preserved in air-tight boxes or packages made of wood, pasteboard, or paper, as they rapidly destroy such substances, while the aluminates of these alkalies are so much less violent in their action that they may be safely inclosed in those materials if the boxes are made air-tight.

My improved saponifier is therefore not only a superior article for the manufacture of soap, but it is more easily and cheaply produced and can be more readily preserved.

What I claim as my invention, and desire to secure by Letters Patent, is—

The use of the aluminates of soda or potassa, either with or without admixture of the hydrates of those alkalies, in the manufacture of saponifier or concentrated lye, substantially in the manner hereinbefore described.

In testimony whereof I, the said HENRY PEMBERTON, have hereunto set my hand.

H. PEMBERTON.

Witnesses:

W. D. LEWIS,
A. S. NICHOLSON.